September, 1947

EDISON ELECTRIC INSTITUTE BULLETIN

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PUBLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

June, 1946-1947

SOURCE AND DISPOSAL OF ENERGY (In Kilowatthours)—MONTH OF JUNE

	1947	1946	%
GENERATION* (Net)			
By Fuel Burning Plants	13,450,940,000	10,942,890,000	+22.9
By Water Power Plants	6,792,877,000	6,680,643,000	+ 1.7
Total Generation	**20,243,817,000**	**17,623,533,000**	**+14.9**
Add—Net Imports Over International Boundaries	119,873,000	146,140,000	−18.0
Less—Company Use	125,945,000	119,336,000	+ 5.5
Less—Energy Used by Producer	324,963,000	231,046,000	.....
Net Energy for Distribution	**19,912,782,000**	**17,419,291,000**	**+14.3**
Losses and Unaccounted for	2,366,663,000	2,234,283,000	+ 5.9
Sales to Ultimate Customers	**17,546,119,000**	**15,185,008,000**	**+15.5**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of June 30th			
Residential or Domestic	30,642,764	28,981,734	+ 5.7
Rural (Distinct Rural Rates)	1,436,867	1,303,861	+10.2
Commercial or Industrial:			
Small Light and Power	4,848,281	4,573,158	+ 6.0
Large Light and Power	184,771	169,582	+ 9.0
Other Customers	130,255	119,807	+ 8.7
Total Ultimate Customers	**37,242,938**	**35,148,142**	**+ 6.0**
KILOWATTHOUR SALES—During Month of June			
Residential or Domestic	3,368,562,000	2,954,241,000	+14.0
Rural (Distinct Rural Rates)	557,681,000	443,325,000	+25.8
Commercial or Industrial:			
Small Light and Power	3,060,152,000	2,617,144,000	+16.8
Large Light and Power	9,356,135,000	7,962,741,000	+17.5
Street and Highway Lighting	153,607,000	147,155,000	+ 4.4
Other Public Authorities	475,292,000	458,817,000	+ 3.6
Railways and Railroads:			
Street and Interurban Railways	344,591,000	341,842,000	+ 0.8
Electrified Steam Railroads	186,164,000	208,619,000	−10.8
Interdepartmental	43,935,000	51,124,000	−14.1
Total to Ultimate Customers	**17,546,119,000**	**15,185,008,000**	**+15.5**
Revenue from Ultimate Customers	**$309,630,500**	**$277,103,700**	**+11.7**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—for 12 months ended June 30, 1947			
Kilowatthours per Customer	1,385	1,290	+ 7.4
Average Annual Bill	$43.49	$42.70	+ 1.9
Revenue per Kilowatthour	3.14¢	3.31¢	− 5.1

(*) By courtesy of the Federal Power Commission.

Vol. 15, No. 9, EDISON ELECTRIC INSTITUTE BULLETIN; published monthly. Entered as second - class matter Aug. 1, 1933, at the post office at Philadelphia, Pa., under the act of March 3, 1879. Publication office, 56th and Chestnut Sts., Philadelphia, Pa. Editorial office, 420 Lexington Ave., New York, N. Y. Subscription rate $2.00 per year in the United States; $3.00 per year in foreign countries.

The Edison Electric Institute does not assume responsibility for, nor necessarily endorse or approve, statements made by contributors to the BULLETIN.

EDISON ELECTRIC INSTITUTE BULLETIN

Volume 15 SEPTEMBER, 1947 No. 9

Oakes Announces Five Billion Dollar Construction Program of Electric Power Companies

FIVE billion dollars will be spent by electric light and power companies in the United States on construction within the next five years, Charles E. Oakes, President of the Edison Electric Institute, said last month in announcing the publication of the industry's Statistical Bulletin covering operations of the year 1946.

Construction volume by the locally operated electric power companies has already accelerated to the rate of a billion dollars a year, and this rate is expected to be maintained throughout this year and during the following four years, Mr. Oakes said.

The total of $5,000,000,000 is more than one-third of the present entire capitalization, $13,000,000,000, of the 65-year-old business-managed electric industry. It will add more new generating capacity to local company plants than is presently installed in all of the Governmentally-owned power projects, including TVA, Boulder Dam, and Bonneville. (At the end of 1946 the electric companies had 40,360,000 kw of generating capacity installed, while the Federal projects and other public installations totalled approximately 10,000,000.)

About 95 per cent of the new generating installations will consist of steam turbines using coal, oil or gas. Despite the large increase in governmental hydro-electric developments in recent years, the installed capacity of all water power plants still comprises less than 30 per cent of the total generating installations. In 1936 it was 29 per cent and in 1926 it was 27 per cent. Within the next three or four years the percentage probably will have dropped below the 1926 figure.

The electric light and power industry completed one of the most active years of its history in 1946, the Statistical Bulletin states. Total sales of current by all utilities—public and private—approximated 191 billion kwhr, a decrease of 1½ per cent from the 193,558,000,000 sold in 1945. Revenues from these sales approximated $3,460,000,000, an increase of 3½ per cent over the $3,341,518,000 of the year before. Average unit prices continued to decrease, dropping from an average charge of 3.41 cents in 1945 to 3.22 cents per kwhr in 1946 for residential service. (This figure had declined to 3.14 cents for the 12-month period ending June 30, 1947.)

For the year 1946 as a whole, the average residential customer increased his consumption of electricity by 100 kwhr per year, bringing the total to 1329 as compared with 1229 the year before. (At the present time average consumption is approaching 1400 kwhr per year.) This 100 kwhr gain in 1946 sets a new record in the year-to-year increase in household use and compares with 78 in 1945 and 81 in 1944. It reflects, among other things, the results of the high national income and the greatly expanded purchasing power of the country as indicated, in part, by the greatly enlarged flow of electrical appliances into the American home.

During the year, 2,109,218 new customers were added to the books of the local electric utility systems bringing the total at the end of the year to 36,140,291. This increase was accomplished in spite of the housing shortage and the difficulties encountered in procuring poles, wire and electrical equipment. The gain of 1,800,000 in homes and farms constitutes the largest number of new connections in the history of the utility industry. It is almost twice the 836,000 added in 1945 and exceeds by 10 per cent the previous high record made in 1924.

(During the first six months of this year, the electric industry added 1,102,000 new customers to power lines, of which 929,000 were urban and rural residential users. Since V-J Day until the end of June, 3,545,000 customers in all categories have been added to power lines.)

In 1946, over 400,000 additional farms were connected to electric power lines, bringing the total at the end of the year to 3,336,000. This represents 57 per cent of the number of farms reported by the Census at the close of 1944. In addition to farm homes already connected, there is an additional 800,000 farms, reached by electric power lines, which have not yet taken service. The total number of farms reached is equal to three-quarters of all occupied farms in the United States.

Of the 3,336,000 farms served, some 1,261,000, or 38 per cent are on the lines of REA cooperatives; 191,000 or 6 per cent are served by municipal systems or other public bodies and 1,884,000 or 56 per cent are served by the business-managed electric utility companies. It is probable that at the end of 1946 not more than 1,750,000 farms remained to be reached by power lines.

During the year a large decrease in fixed charges of electric companies was accomplished, representing the cumulative effect of the refunding programs of the past few years. Interest, amortization and other deductions from income, which were $360,000,000 in 1945, declined by $91,000,000 to a total of only $269,000,000 in 1946.

The year's increase of $109,000,000 in gross revenues was wiped out by a rise of $133,000,000 in operating expenses, two-thirds of which were attributable to increased wages and salaries. In spite of favorable water conditions over most of the country, which enable hydro-electric plants to operate at high levels, the cost of fuel rose by $42,000,000 and reflected the increase in the price of coal (or its equivalent in other fuels) from $4.45 per ton in 1945 to $4.89 in 1946. A partial offset to high operating costs was caused by the ending of the Federal "excess profits" tax but this saving was not as great as had been expected.

Second Farm Electrification Conference to Be Held in Indianapolis on October 7-8

THE second National Farm Electrification Conference will be held at the Claypool Hotel, Indianapolis, Ind., on Tuesday and Wednesday, Oct. 7 and 8, with an estimated 500 agricultural, educational, farm publication, industrial, contracting and merchandising leaders in attendance. Major emphasis this year will be placed on audience participation in the discussion of four subjects of extreme importance to the future success of the farm electrification movement.

The topics will be presented in panel discussion form by groups of men and women who are authorities in their respective fields. In order to stimulate greater participation on the part of those present and also to give the discussion periods an air of greater informality, the various panel members will speak from notes, rather than read prepared papers.

Chairmen of the four panels and the subjects to be covered are: J. R. Waters, Fairmont, W. Va., rural service manager, Monongahela Power Company—Farm Wiring and Re-Wiring. G. A. Rietz, Schenectady, N. Y., manager, Farm Industry Division, industrial divisions, General Electric Company—Farm and Home Electrical Uses, Experimental and Research Work, Unfilled Farm Electric Equipment Needs. Hugh Curtis, Des Moines, Ia., managing editor, *Successful Farming* Magazine—Problems of Distribution and Servicing of Equipment. Prof. J. H. McLeod, Knoxville, Tenn., acting director of Agricultural Extension, University of Tennessee — Education and In-Service Training.

One of the highlights of the Conference will be a dinner meeting, scheduled for the night of October 7.

The two-day meeting is expected to attract more than 500 persons, including power supplier executives, deans of Colleges of Agriculture, directors of State Agricultural Experiment Stations, electrical manufacturing and merchandising leaders, farm electrification authorities in the Department of Agriculture and editors and publishers of the farm and electrical trade press.

The objective of the Conference is "to bring together in conference individuals and groups interested in raising farm living standards and reducing costs by increasing the profitable uses of electricity on farms."

Hassil E. Schenck, president of the Indiana Farm Bureau, is chairman of the 1947 Conference, with George W. Kable, editor of *Electricity on the Farm* Magazine, vice-chairman.

The growth of the Conference has led to wider participation in it by various interested organizations. Efforts are being made to extend such participation to all national groups concerned with benefiting rural families economically, educationally and socially. In the present electro-agriculture age, it seems apparent that only through discussions at top levels can views be exchanged and ideas for programs evolved to help farm families in their desire to achieve maximum results in putting electricity to work in their homes and on their farms.

Among the organizations participating in the Conference, and their representatives, there are: Agricultural Education Service (U. S. Office of Education), A. H. Hollenberg; American Agricultural Editors Association, Milon Grinnell; American Farm Bureau Federation, Wilfred Shaw; American Institute of Electrical Engineers, M. J. McHenry; American Society of Agricultural Engineers, James B. Stere; American Society of Mechanical Engineers, G. A. Rietz; American Washer and Ironer Manufacturers' Association, John M. Wicht; Edison Electric Institute, E. C. Easter; Farm Equipment Wholesalers Association, Charles E. Woodward; National Association of Farm Water Supply Manufacturers, Herbert C. Angster; National Electrical Contractors Association, Paul M. Geary; National Electrical Manufacturers Association, Russell J. Gingles; National Electrical Retailers Association, Clifford C. Simpson; National Electrical Wholesalers Association, Ralph J. Brown; and the U. S. Department of Agriculture, Extension Service, H. S. Pringle.

TENTATIVE PROGRAM

Tuesday Morning, October 7

Purpose of Conference and Introductory Remarks by the Presiding Officer, Hassil E. Schenck, President, Indiana Farm Bureau, Inc., Chairman of Conference.

Address of Welcome — Governor Ralph E. Gates of Indiana.

Distribution and Servicing of Farm Electrical Equipment — Hugh Curtis, Managing Editor, *Successful Farming* Magazine, Des Moines, Ia., Chairman, Panel discussion.

Tuesday Afternoon, October 7

Presiding Officer—Truman E. Hienton, Head, Farm Electrification Division, U.S.D.A., Program Chairman.

Agricultural Development Activities by Power Suppliers—L. M. Smith, Vice President and Director of Public Relations, Alabama Power Company, Birmingham, Ala.

Farm Wiring and Re-Wiring—J. R. Waters, Residential Promotion Manager, Monongahela Power Co., Fairmont, West Va., Chairman, Panel discussion with exhibit demonstration.

The American Farmer Looks Ahead—J. E. Stanford, Executive Secretary, Kentucky Farm Bureau Federation, Louisville, Ky., at Conference dinner, Claypool Hotel.

Wednesday Morning, October 8

Presiding Officer—George W. Kable, Editor, *Electricity on the Farm* Magazine, Vice-Chairman of Conference.

Farm and Home Uses, Experimental and Research Work, and Unfilled Farm Electric Equipment Needs—George A. Rietz, Manager, Farm Industry Division, General Electric Co., Schenectady, N. Y., Chairman, Panel discussion.

Conference Business Meeting and Luncheon.

Wednesday Afternoon, October 8

Presiding Officer—Mr. Schenck.

A New Era in Agriculture—Claude R. Wickard, Administrator, Rural Electrification Administration, Washington, D. C.

Education and In-Service Training—J. H. McLeod, Acting Director, Agricultural Extension Service, University of Tennessee, Knoxville, Tenn., Panel discussion.

Three-minute summaries and suggestions by each panel chairman, and a final summary of the Conference by Mr. Schenck.

Electric Road Show of Union Electric Packs 'Em In

Reprinted from the *Union Electric Quarterly* of the Union Electric Co. of Missouri, St. Louis, Mo.

THEY say there is no business like show business. The Union Electric Residential Sales Department should have the answer to that after sending that grand old trouper, "Electrical Living," on a bang-up tour through the outlying territories this spring. Tens of thousands turned out to see the new electrical appliances exhibited in eight towns in the series of "Electrical Living Shows" sponsored by local dealers in cooperation with Union Electric.

The idea stemmed directly from the success of the famed "Electrical Living Home" in the lobby of the Main Office in St. Louis last winter. To bring home the advantages of electricity to customers and potential customers in the areas served by the Company, the Sales Department planned and executed eight "Electrical Living Shows" built around local dealers and their merchandise throughout the System.

Three-Day Stands

Missouri locations were Festus, De Soto, Union, Washington, and St. Charles; Iowa, Keokuk and Fort Madison; Illinois, East St. Louis.

All towns held three-day shows. People flooded the halls every night to see the wonderland of modern electrical appliances spread before them. Armories and basketball courts were transformed into wizards troves of postwar marvels.

Carnival atmosphere permeated every show. Bright lights blazed from ceilings. Spots and colored lights added drama to individual booths. Radios and phonograph combinations spun webs of music. Many of the "Electrical Living Shows" scheduled evening entertainment; the packed auditoriums hushed to listen to the music of the local high school band. East St. Louis rounded up some radio cowboys who distributed doleful ballads and autographs to their audiences.

Hundreds of Appliances

But the main attractions were the hundreds of electrical appliances. Ranges, refrigerators, electric water heaters, toasters, irons, handsome mahogany consoles matching their dusky beauty with the blonde modern woods—these were the real star performers. The lines of many manufacturers were represented and to the public each booth had its own special appeal.

Mothers carried their infants in their arms, listened attentively as electric laundry demonstrators explained how to take the drudgery out of Monday and Tuesday. Newlyweds stood in all-electric kitchens, dreamed of homes to be. Women inquired about the marvelous dishwashers and garbage disposal units, looking forward to the day when an electric sink could relieve them of bothersome tasks.

Farm Equipment, Too

Farmers inspected milking machines, talked electric brooding and crop rotation, left with pockets bulging with literature. Wives gathered around automatic washers swishing through complete laundry operations, while their husbands wandered with masculine enthusiasm through power tool displays.

Above the crowds a painted slogan proclaimed "Live Better—Live Electrically." Not mere words painted on canvas to these people—words to conjure with. Very real, meaningful, promising words with the magic of the future in them.

Electric cooking demonstrations by Union Electric Home Economists drew hundreds of homemakers from every locality to the afternoon sessions. The ranges and refrigerators used in the all-electric demonstration kitchen were furnished by local dealers determined by lot and changed daily to permit as many lines as possible to be represented. The backdrops, cabinets, electric sink, and small appliances were furnished by the Company and were shifted from town to town by the Display Department.

Cooking Short-Cuts

Union Electric Home Economists prepared three meals each session in the mobile all-electric kitchen on stage. Visitors picked up cooking short-cuts, new uses for familiar electrical appliances, nutrition saving methods, and a conviction of the superiority of flameless electric cooking. Each meal prepared pointed up one of the features of the electric range, the surface unit, the deep-well cooker, the oven, or the broiler. As the finished products were displayed to the gatherings, buzzes of excited approval punctuated the lectures.

To dramatize completely automatic electric cooking, a prominent citizen of the community sealed a whole meal in the oven of a range on stage every morning. The timer controls were set to cook the unattended dinner to perfection by the end of that afternoon's school. In a brief ceremony, the oven was unsealed and the food prepared exhibited to the class. These demonstrations convinced the ladies that an automatic electric range will cook a delicious, planned meal without attention in their absence, have it ready to serve piping-hot on their return—truly taking the cook out of cooking!

The afternoon cooking schools closed with a short lecture on adequate and effective home lighting. A selection of lamps from the celebrated Stratford Lee Morton Collection was displayed in conjunction with this talk.

Behind the Scenes

All the principals of a Broadway hit on tour aren't on the marquee. Some very important people schedule the shows, line up the scenery, and beat the drums for the public. No show ever hung out an S.R.O. sign without the work of these men who don't even rate the fine print in the program.

The "Electrical Living Shows" had plenty of hard work behind the scenes, too. The Residential Sales and Display Department folks who did all the legwork are satisfied to sit back and be happy about a job well done. And well done it was.

In every town selected, the plan of the show was presented and sold to the dealers. Committees of local merchants had to be formed, coordinated, and given all the assistance they needed to produce a four-star hit. Distributors had to be lined up to furnish merchandise for the individual dealers to display. Hall rentals, power and lighting equipment, back-

(*Continued on page* 352)

As Agriculture Goes, So Goes Our Destiny

By Roy Godley
*Rural Service Manager, EEI**

"AS agriculture goes, so goes our destiny," may seem to some of you an exaggeration, but the program of the EEI Farm Section headed by Mr. E. C. Easter of the Alabama Power Company has, during the past year, and is now, being conducted on that basis. We believe that to be true.

The Farm Section is following two lines of activity that may be broadly classified as, Furthering Utilization of Electric Service by Farm People, and Agriculture Development. Under Utilization, we are striving to promote the use of electric service by farm people, so as to contribute most to the social and economic well-being of those we serve.

More Farm Uses for Electricity

As one means of accomplishing this, almost a year ago, a Committee of the Farm Section, with the cooperation of a group of agriculture leaders, developed an In-Service Training Program for agricultural workers. The success of this program will depend primarily on the initiative taken by power companies in organizing In-Service Training work. Agriculture workers have recognized a need and have expressed a desire for this training. We are the group which is best equipped to give it and we will profit most from it.

The second phase of the utilization program has been the development of a Farm Electrification Manual, designed to serve as a handbook for rural service men. Several sections of this publication have been completed and filling of orders has already begun.

In Agricultural Development the Committee is attempting to encourage power companies who serve important farm areas to take an active part in programs designed to build a more prosperous agriculture in their service areas—programs separate and apart from farm electrification. The basis for this approach comes from our belief that power companies of this country must go beyond the generation, transmission and distribution of electric service to rural areas, in order to realize most from the investment made in farm lines and to protect that investment.

A comprehensive, aggressive rural development program means:

1. More revenue from farm lines.
2. Protection of the permanency of the farm revenue, for regardless of whether farm prices are high or low, the efficient farmer will always be your best farm customer.
3. Better public relations.
4. Establish your company as a leader in the farm community.

Agriculture is important to the electric industry, FIRST—because 75 to 80 per cent of the population of this country is being born in rural areas, with their American heritage of free enterprise and individual initiative. SECOND—Agriculture is the largest of all industries. THIRD—Our agriculture economy has a greater effect on the general economy of the nation than any other industry. FOURTH—We have the largest investment in rural areas.

In attempting to further the philosophy of agricultural development in our industry, the Farm Section sponsored an Agricultural Development Clinic with the cooperation of the Monongahela Power Company in Fairmont, West Virginia. Another clinic was recently held in the Northwest under the sponsorship of the Northwest Electric Association. We hope there may be others.

The question may arise as to what is the basis for this approach. It is just this: that the prosperity of the American farmers will materially effect the overall national economy as well as the return on the investment our industry has made, and is making in rural areas.

You can do the best—the most perfect job in the world of generating and transmitting electricity to farm people, and still not be loved by those you serve. In fact, those you serve may vote to sell you out, even though they know you are doing a good job rendering electric service. People think with their hearts. As a man thinketh in his heart, so is he! So you see, your farm people select out of the sum total of their knowledge of you those things which brand you in their heart as a good neighbor, a good citizen, who is doing much to help them do the thing they want to do—be more prosperous. The wanting is the emotional drive and it comes from the heart.

If you are doing a good job of furnishing electricity and in addition are helping to build better communities by taking an active, constructive part in programs that touch every segment of the population you serve, you will always survive, come war, post-war, or no war, or even proponents of other agencies to furnish electric service. We believe that no power company has any future, any tomorrow whatever, save as that future is here now in the desire to contribute most to building better communities. Your customers will do for you, or to you, tomorrow, those things for which they are conditioned today.

Cooperative Free Enterprise

The approach or sales appeal usually used to promote the establishment of other systems of power supply has usually been on the basis of what that organization will do for agriculture, our basic industry. I believe the history of past performance in this field indicates that the present local agricultural agencies, plus supplemental assistance from our industry and other tax-paying business groups, can contribute more to the social and economic level of rural America than can any super development agency. This touches on a subject we hear much about—free enterprise. In the final analysis the people themselves will decide whether free enterprise will survive. I don't know what their answer will be, but this I am sure—free enterprise will only survive if it is *enterprising.* The business managed, tax-paying, electric utilities have an opportunity to really be enterprising by establishing agricultural development departments that will join hands with other groups, state and federal, as well as farm organizations to build a more prosperous agriculture. In so doing you can help to assure a return on the investment you have made in building farm lines, and establish once and for all time, that those communities served by private companies are served best. Farm people will quickly recognize this fact. People of America will know the truth—and the truth shall keep us free.

* Mr. Godley left the service of the Institute on Sept. 1st to engage in public relations activities for the Kroger Company, Cincinnati.

The Electric Industrial Truck for Material Handling

By Charles F. Kells
Electric Industrial Truck Association

SELLING power and handling material, at first glance, seem entirely unrelated.

However, one of the most profitable steps which can be taken by any individual concerned with power sales is to become more intimately acquainted with the various ways by which industry is overcoming the problems of material handling.

Within any business today there is an expenditure of man-hours, and of man-effort, that adds only to the cost of production and nothing to the value of the merchandise. This expenditure is made in the handling of material in its flow from raw sources, through process, and into shipment to the consumer. There has to be a certain amount of time, effort, and money expended in this handling. However, within this very operation lies the opportunity for management to effect savings — and substantial savings—that often will represent the use of black, rather than red, ink on the ledgers of the business.

Man-hours and man-effort consumed in the repetitive pick-up-and-deposit, in the production line of business can be materially lessened —with consequent substantial savings in dollars-and-cents—by substituting mechanization for muscle. This extends to practically every operation involving the actual handling of material. The activity of the workers, relieved of these time-consuming and money-consuming operations, thus may be diverted into other, more productive and profitable operation.

It may be repeated: *Material handling adds nothing to the value of merchandise, only to the cost of its production.* That is why industrial engineers consider it to be one of the few remaining operations within which it still is possible for most industries to cut production costs drastically. The mechanized industrial truck ranks high in the list of aids upon which management can call to achieve industry's constant goal: Higher production at lower cost.

The industrial truck system was used most effectively by the armed forces during World War II in building and moving the mountains of necessary supplies. Shipping space was at a premium. Industrial trucks were called upon to perform their various functions in stacking, tiering and stowing.

Power trucks were not a "war baby." They had been known—and used—for many years. Their potentials as cutters of expense, as speeders of production flow, and of their full range of applications, had hitherto not been fully realized. It took the demands of war to forcibly bring home to industrial management something that industrial engineers had known and preached for years: *The modern industrial truck, with one-man operation, can accurately pick-up, move, position and deposit, bulkier and/or heavier loads, in faster time and with greater safety to man and material, than any other known material handling device.*

Fig. 1—Placing barrelled products in storage at chemical manufacturing plant with aid of highlift, platform, battery-powered industrial truck. Use of such trucks in this plant solved storage problem and thus avoided additional and expensive warehouse construction. Truck shown here has special safety platform fitted over regular platform, providing greater carrying surface. Remote control device permits operator to raise or lower while on platform

The modern industrial truck had its beginning some 40 years ago. An official of a large railroad in the United States, confronted with the problem of moving increasing mountains of baggage at one of the road's important terminals, hit upon the idea of applying a self-contained electric power unit — storage battery and motor—to an ordinary flat-bed platform, burden-carrying, baggage truck. The idea worked out so successfully that, in the years since, there has been evolved the modern storage battery-powered truck, in many types, for many duties and so constructed and powered that heavier

Fig. 2—Skid-load of mine jack housings (3,500 pounds) being transported to stores department from production line by storage battery-powered, lowlift platform truck. The plant where this truck operates has used a battery-powered truck fleet for more than a quarter of a century with resultant increased production and lowered material handling costs.

and heavier loads can be handled. Reliance has been placed upon storage battery power for safety and economy of operation and maintenance and—most important—because such a powered truck has the highest availability rating, measuring "availability" as "Hours Used against Hours Scheduled for Use."

Today battery-powered trucks have graduated from being mere baggage carriers. They are used by railroads in passenger and freight terminals, in warehouses, and in car and engine repair shops. The rubber industry finds their use invaluable in the maintenance of process flow. The ceramics industry finds their use almost mandatory, as does the chemical industry, because of their safety factor, their quietness of operation, the absence of fumes and the fact that they do not "breathe in" corrosive and abrasive materials suspended in the air of many such plants.

Automobile manufacturers use storage battery-powered trucks as do the paper, textile, printing and food industries. Manufacturers and fabricators of steel, aluminum and other metals; of machinery; of tobacco products; of soft drinks —all are users of the electric truck of one type or another. The lumber industry and food processing plants also rank high in the list of actual and potential users of electric trucks.

In the past 22 years, according to the results of a survey made by the Electric Industrial Truck Association, there was a 350 per cent increase in the number of battery-powered industrial trucks in use, the figure being over 39,775 at the end of 1945, as compared with 11,350, at the end of 1923.

The first type of industrial truck with the battery-powered, fixed platform, was followed by the lowlift platform design. This truck can be maneuvered under a skid which has been manually loaded. The loaded skid can be lifted clear of the floor, moved to another location and deposited, and may be moved from job to job without waiting for the manual loading of the platform.

The next stage in the development of the truck was a logical one. This was to make a truck that would lift a load high enough to permit tiering the preassembled loads. The result was the so-called highlift platform truck. The height of lift of this truck, at first, was not much more than six feet. Advances now enable loads to be tiered at heights as great as 135 in., while special telescopic devices have even increased this height, enabling loads of 10,000 pounds or more to be lifted to, and placed at, extreme heights by one man.

Contemporary with the lowlift truck was the development of the battery-powered industrial tractor. This made possible the assembly of loads—manually stacked—on relatively low cost platforms on wheels, otherwise known as live skids, trailers, buggies, flats or dollies. These are moved in long trains over long distances on piers, in warehouses, railway terminals and factories.

Shortly after World War I, the fork truck appeared—and with it the first pallets. The fork truck possessed the self-loading advantage of the platform lift truck and, in addition, offered two remarkable improvements:

1. It could self-load and carry a pallet that used only 4 in. to 5 in. of

Fig. 3—Storage battery-powered tractor moving train of merchandise-loaded dollies in warehouse of company operating a chain of variety stores. Through the use of battery-trucks of tractor and fork-lift types, this company has doubled amount of merchandise passing through its warehouse to its 102 retail outlets and now handles turnover of about 21,000 different items of stock on the average of 14 times annually.

vertical height in tiering, as compared with the 7 in. to 12 in. required when skids were used.

2. The load could be moved directly up to a solid wall of tiered material, or against a machine—because no clearance for undercarriage was required—and pick up a foundation structure that could rest directly on most surfaces because the weight was distributed over the entire underside of the pallet.

The fork truck also could pick up and transport skids; load and unload trailer trains, could also be used as a tractor to pull the train. In addition, it could high-tier goods in storage thus enabling full use to be made of the vertical rights in a warehouse. With material palletized into unit loads, this truck could be used to load or unload box-cars, flat-cars, highway motor trucks and motor trailers, airplanes, ships and barges.

Special adaptations of the lift trucks soon appeared in the form of rams, scoops, dump trucks, while special attachments were developed for fork trucks that enabled them to perform new operations.

The sharp increase in the popularity of the industrial truck system that followed its application to military requirements, stimulated the application of the system to peacetime requirements. Many in management who never before had made use of industrial trucks, were called upon during the war to make shipment of their product on pallets. The fork truck naturally was chosen as a shop tool and handling device for loading cars, and for storing and removing from stores countless varieties of goods and assemblies.

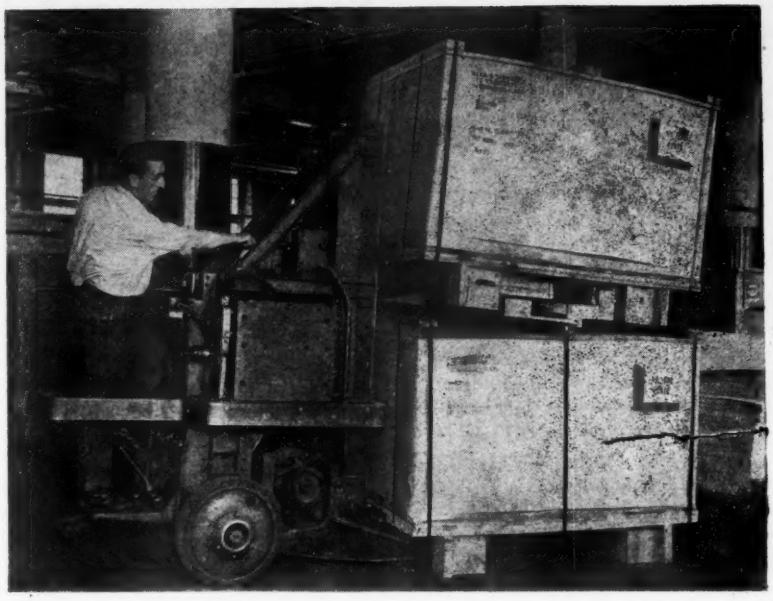


Fig. 5—Tiering a strapped-to-skid load of coated flat stock in paper warehouse by means of a storage battery-powered, highlift, platform truck. Weight of paper and skid is well in excess of 4000 pounds, yet operation, which by manual means would take several men and at least fifteen minutes, is performed by truck operator in less than a minute and a half.

While the attention of management has thus been focused upon an opportunity to materially cut the expense of handling product in process; to move goods faster in process by keeping workers amply supplied with material; to save costly—and at present almost unattainable—warehouse construction by full utilization of hitherto wasted vertical air space in existing structure, it must still be remembered that the industrial truck system offers no panacea for the ills of industry.

In the majority of applications this industrial tool must be as carefully fitted into the production and distribution system of any industry as is any machining or processing phase. It must be engineered into the scheme of production and distribution. This is particularly true in the present emphasis that is being placed on a further decentralization of industry into plants employing 300-500 people.

The industrial truck provides mechanical handling for production and shipping operations that could not afford expensive, fixed systems of handling. A good floor, plus battery-powered trucks, will provide a low-cost, flexible, dependable system. This system is susceptible to an infinite variety of plans for arrangement of machines, holding storage areas, warehousing areas, and spots for loading and unloading common-carrier trucks and cars. The electric truck system also adapts itself so readily to proposed changes in production, storage, and loading facilities that another insistent demand is created for its application.

The industrial truck system should

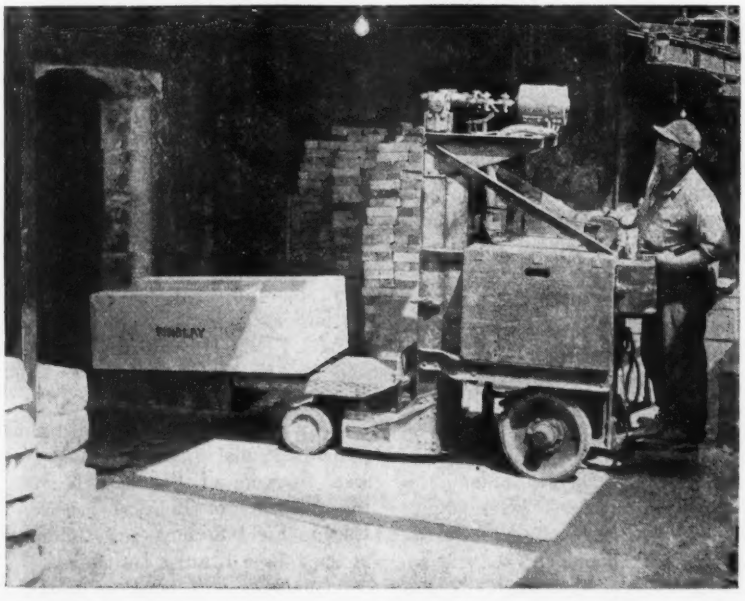


Fig. 4—Clay products, weighing up to 3500 pounds, are quickly moved into the huge kilns of this refractory brick-making plant by battery-powered, highlift, platform trucks. This truck handles an average of 40 tons of material each shift.

never be purchased blindly by management. While it will have many uses as a "strong man," its major usefulness takes place in planned production and distribution systems. It must be integrated into production plans that call for conveyors for many long runs of repeat operations. It must complement the overhead crane where awkward loads of great weight are involved. It must supplement gravity chutes in multi-story warehouses and factories. In many plants, however, such as the job-shop, or wherever common-carrier loading and warehousing are major functions, the entire system will be economically built around skid-platforms and fork-truck-pallet systems.

The plant manager who always has supposed that he has not had enough work to justify the use of a power truck may be astonished to find, if he makes a serious attempt at cost analysis, that he not only has more than enough work, but already has paid for several power trucks in needless handling expense.

A power truck can make such huge savings in comparison with the cost of manual handling that it need not be busy continuously to show a profit. In many instances a truck having no more than an hour's work a day can pay for itself inside of a year.

For an illustration, the advisability of the purchase of a 2-ton, lowlift, platform truck will serve. It is assumed that the work it is to perform is the movement of material over a distance of 100 feet. If the material is piled on skids in the amount of two tons per skid-load, the truck, working continuously, may be expected to handle some 53 loads, or a total of 106 tons, per hour.

At present the material is being moved by hand truckers who handle an average of 350 pounds per trip, making an average of 20 trips per hour. This is at the rate of 3½ tons, per trucker, per hour.

It has been established through the use of an Annual Operating Cost Summary Form, developed by the Electric Industrial Truck Association, that a typical estimate of the cost of owning and operating the truck 8 hours a day, based on present prices for equipment and power, would be approximately $1.91. To this—still remaining on the conservative side—the wages of the truck operator will be figured at $1.00 an hour. That makes a total cost—if the truck is operated for only one hour—of $2.91. For this expenditure there has been accomplished the movement of 106 tons of material a distance of 100 feet. The cost has been 2.75c. a ton, for distance moved, or 2¾c. per 100 ton-ft.

The hand-trucking cost will depend very largely upon the truckers' wages. If, conservatively, the wages for this type of labor is 50c. an hour, the cost for the movement of 3½ tons will be 14.3c. a ton. To move the 106 tons by manual means would take approximately 30 trucker hours. The cost would be $15.00, compared with $2.91 for the electric truck.

Assuming the truck will be operated 7 out of the 8 working hours of the day, total movement will have been 742 tons. The cost would have been the basic $1.91 for the truck, plus the $7 representing the wages for the operator—a total of $8.91, or a cost per ton for movement of only a fraction more than 1c. a ton. To move the same tonnage manually, under the same assumed conditions, would still entail the expenditure of 14.3c. per ton, while the time consumed would be 212 hours, or 26½ working days—while the cost would have been $106.00.

It is figures, such as the above, that form the basis for the statement that a battery-powered industrial truck, including battery and charging apparatus, will pay for itself within a year if kept busy only an hour or so a day. This type of industrial truck can pay for itself and equipment within three or four months if applied full-time to a job that hitherto had been performed as a strictly manual operation.

It likewise has been demonstrated that it is economically possible to own and operate battery-powered industrial trucks, and enjoy their quiet, fume-free, and inherently dependable advantages even though they may be used to the fullest only in seasonal operations.

In addition, labor pool organizations have found it entirely feasible to load battery-powered trucks and portable charging equipment aboard vehicles of transport and move from job to job, thus insuring almost year-around operation of the trucks and a full realization of their low-cost, reliable, work potential.

No brief summary of battery-powered industrial truck operation, such as the foregoing paragraphs, can thoroughly encompass the scope of this development. It can, however, awaken the thinking of many to the possibilities for constructive guidance and suggestion. While mechanized material handling has shown marked growth in recent years, there is still a large untapped market for improved practices.

Luther R. Nash

LUTHER R. NASH, consulting engineer and public utility rate expert, died Aug. 11 at Danbury Hospital, Danbury, Conn., at the age of 76, after an illness of two days followed by a cerebral hemorrhage.

From 1895 to 1938 Mr. Nash had been associated with Stone & Webster Engineering Corporation of New York City and Boston. His early work with this company included the design of electrical installations, supervision of construction, and engineering management.

An authority on rates, regulatory practices, depreciation and accounting methods of the public utility business, Mr. Nash, in 1933, became vice president of Stone & Webster, in charge of appraisals and rate investigations. He continued in this capacity until his retirement from active business in 1938. Widely recognized as an expert appraiser of utility properties, he frequently appeared before commissions and courts, preparing cases in some 20 states, several territories and foreign countries.

During the last decade of his life, Mr. Nash specialized in the study of utility depreciation practices, serving on one or more committees of the electric power industry investigating this subject.

His writings on public utility problems were widely read and quoted. Mr. Nash's most recent book, published in March of this year, is "The Anatomy of Depreciation." Previous works: "The Economies of Public Utilities" and "Public Utility Rate Structures." In addition to his books he contributed frequently to technical and economic journals and wrote a newspaper column titled "How's Business," which he discontinued at the outbreak of the last war.

Mr. Nash graduated from the Massachusetts Institute of Technology in 1894 and subsequently studied at Harvard, receiving a Master of Science degree from that university in 1898. During his business years he conducted courses at M.I.T., the Harvard Business School, and for the Massachusetts Department of Education.

He was a member of several technical and professional organizations, the American Institute of Electrical Engineers, the Academy of Political Science, the Eugene Field Society, and Committees of the Edison Electric Institute.

Mr. Nash was born in Ridgefield, Conn., where he was living at the time of his death.

How Public Service Co. of N. J. Handles "Trouble Calls"

By Thomas L. Hall

Engineer, Office of Distribution Engineer, Electric Distribution Department

Reprinted from the *Public Service News* of the Public Service Co. of N. J.

THE Public Service electric system, which serves more than 1,000,000 separate meters, is a complex arrangement of stations, substations, and a network of electric circuits containing 67,500 miles of conductor on pole lines and in cable. The system is based on five generating stations: Marion, Essex and Kearny in the Newark-Jersey City area; Burlington and the smaller Perth Amboy (a new station at Sewaren is under construction).

In addition to the generating stations, there are interconnections to other companies by means of 220,000-v transmission lines at Roseland Switching Station, with smaller capacity ties at lower voltage at Trenton, Perth Amboy, Roseland and Ridgewood. The four big stations and the larger interconnections are tied together by a system of 132,000-v double circuit tower lines which include switching or distributing stations at Essex, Marion, Athenia (Passaic), West Orange, Bayway, Metuchen, Trenton, Burlington and Camden. Additional switching stations are also under construction at Sewaren and Ridgefield (Bergen).

From the generating and switching stations lines at 13,000 or 26,000 v radiate to 85 substations and to a number of large industrial customers. At the substations the voltage is further reduced to 4150 volts, at which the distribution feeders operate. These feeders cover the entire territory like a net and to them are connected the primary customers and the pole mounted and subway distribution transformers which change the voltage of the feeders to the 120/240 or 120/208-v combinations which is distributed through short secondary mains for use by the great majority of customers.

Trouble is likely to occur on any electric system. Public Service is no exception even though high grade engineering and workmanship has greatly reduced both the frequency and severity of trouble over the years. There are apparatus and equipment failures from numerous causes. Outside interference from malicious mischief, vehicles, animals and birds, or from the elements, cause a very large percentage of the troubles and there are a few operating errors.

When trouble does occur which leads to a service interruption, restoration of the service is the prime consideration, taking second place only to elimination of hazards to the public or to company personnel.

The high tension system which includes all electrical equipment and lines from the generators to the substations is operated by the System Operator through the Load Dispatchers.

Troubles on the high tension system usually do not cause customer interruptions, since it is built for a high degree of reliability with numerous parallel feeds. When major troubles do interrupt service, a great many customers are affected and the interruption may be of long duration. Most of these interruptions are unpredictable and no specific instructions can be developed for handling them. Service restoration depends largely on experience and ingenuity, guided by general rules of operating procedure.

The run-of-mine trouble on the high tension system includes circuit trip outs from various causes, wires down and cable failures, all of which are handled on a more or less routine basis.

Cable splicers at work on a high voltage splice in the underground system

The low tension system includes all equipment and lines from the substation to the customer's main fuses. This system is operated by the individual division organizations. Except for network zones, low tension troubles almost always result in customer interruptions, since parallel feeds are the exception rather than the rule. These interruptions naturally do not involve as large a number of customers as do those on the high tension system. Because of the complexity of the system, a great variety of troubles occur; substation apparatus failures, cable and transformer failures, wires down, transformer fuse operations, blown customer's fuses, etc.

Considering the size of the Public Service system, interruptions to a given customer are few and of relatively short duration. During 1946 the average interruption was 40 minutes including blown fuses on customers' premises. Even at that the number of no-light and no-power calls received at the Essex Division Service Dispatcher's board, for instance, will run almost 32,000 per year, 80 per cent of which are caused by troubles on customers' premises and beyond the limits of repairs by Public Service.

Handling any case of trouble is divided into five distinct parts: Isolation of the trouble, Restoration of service, Locating the fault, Making repairs, Analysis with the view of preventing or reducing similar troubles.

Isolation of trouble is largely automatic. All circuits and equipment down to and including the 4150-v feeders are equipped with relays which trip the circuit breakers that will clear the fault. In the network system used in congested commercial areas, several feeders are tied through transformers to a common low-voltage grid. Relays and breakers are so arranged that a fault feeder will be cleared leaving the low-voltage grid in service. Faults on the low-voltage grid are self-clearing.

Individual transformers on radial (non-network) feeders are fused so that a fault on a transformer or its secondary (low voltage wires feeding individual customers) will be cleared leaving the remainder of the feeder in service. Fuses are required at all service entrances, confining interior wiring troubles to the premises. The efficiency of the protection scheme is very high. Only about three incorrect relay operations occur per 100 faults.

Service Interruptions

Restoration of service and location of the fault go hand-in-hand. Faults on station apparatus are usually self-evident. Unless the trouble is of major proportions, these faults together with those on transmission lines usually cause no service interruptions. Some transmission and practically all distribution (4150 v and below) failures cause service interruption and in some cases the trouble must be located before service can be restored. A considerable portion of faults, particularly on overhead lines, are of a transitory nature, caused by insulator flashovers, birds, animals or foreign objects on the line, tree limbs, wires swinging in the wind, etc. Most of these are burned clear by the fault itself. For this reason it is usual to reclose overhead circuits immediately after tripout. Wires down on a distribution circuit, even though causing an initial tripout, will quite often stay in service upon reclosure, restoring service up to the break.

More often than not, open-wire troubles are reported by the public, either by someone seeing the actual fault or by customers calling in that they have no service. These calls are routed to the Service Dispatcher who diagnoses the trouble from the nature of the calls and assigns troublemen or line gangs to make repairs.

When location of a fault is not reported by the public, patrol of the line or testing is resorted to. Testing is usually done by opening the line at convenient points and then reenergizing the feeder section by section until the fault is located.

The only open-wire circuits on which fault location apparatus is used are the 220,000-v lines out of Roseland Switching Station. These lines are equipped with meters which measure the current flowing to the fault from each end of the line. Comparison of these readings gives an approximate indication of the location of the trouble.

Whether or not repairs are made immediately is simply a matter of which way service can be restored more rapidly. In the simple case of a wire down, putting it up again is the quickest way of restoring service. On the other hand it takes quite a time to replace a transformer or to straighten out a congested pole which has been broken off by an automobile. In such cases it is usual to cut the trouble clear and restore service by means of emergency tie points or by temporary work.

Trouble on underground cable requires a different procedure. The location of underground trouble is seldom reported by the public. Fault location may take several hours and repairs even longer. The first step is, therefore, the restoration of service. Practically all underground circuits on which a failure will cause service interruption are equipped with cutover facilities, whereby the load may be transferred to other sources of supply.

The cut-overs may be accomplished in several ways. Sometimes the individual transformers or individual large customers have duplicate feeds arranged so that they may be transferred from one to the other. In other cases portions of the 4150-v circuit may be switched to other circuits, while in others, the secondary mains may be connected to other transformers. In very dense load areas the network system is used. The type of cutover provided depends on economics and local conditions.

Bridge Fault Finder

The actual fault location work on cable is in most cases, a highly technical job performed by engineers. Two methods are in general use, measurement and tracer current. Both depend upon the fact that current will flow through the fault between the conductor and ground.

The measuring methods make use of an electrical device called a bridge. Balancing the bridge gives data from which the distance between the bridge and the fault can be determined. There are numerous corrections which tend to make the bridge inaccurate and, therefore, it is generally used only to determine the approximate location of the fault as a timesaver before application of a tracer current fault locator.

A tracer current fault locator causes a current to flow out on the faulty conductor and through the fault, returning through ground. This current is given a peculiar characteristic so that its presence in the cable may be readily indicated by a suitable pick-up device. Current will flow in the cable ahead of the fault but no current flows beyond it. The fault is, therefore, located by applying the pick-up device at intervals along the cable until two adjacent manholes are found, in one of which test current flows in the cable but not in the other. The failure will then be between the manholes. Usually the failure occurs in the manhole and is located by the presence of smoke before reaching this last step in the location.

Tracer Currents

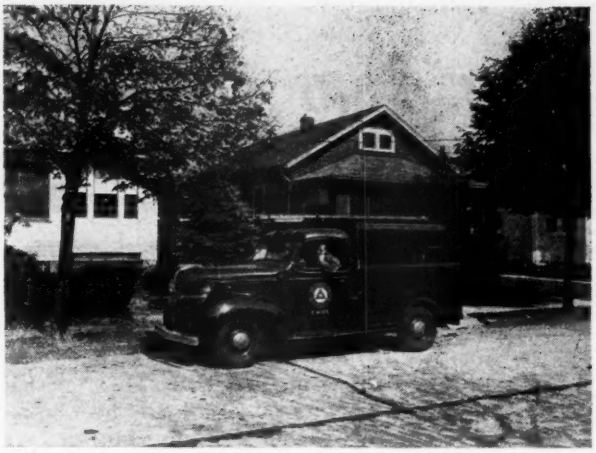
There are three types of tracer-current locators in use by Public Service. The Lundin imposes a modulated alternating current on the cable. The pick-up device is a coil with an earphone. The G. E. "Thyratron" fault locator, uses an intermittent direct current, while the impulse fault locator utilizes a condenser discharge. The pick-up devices for the latter two are indicating meters.

The Lundin is becoming obsolete. The other two devices are about on a par except for certain special applications. The impulse fault locator however has the advantage of being smaller, cheaper and takes less power for its operation.

All repairs after underground trouble follow the same general pattern. Faulty apparatus is replaced immediately and repaired or salvaged at a later date. The greatest enemy of underground equipment is moisture. A large percentage of underground cables are submerged and water will enter the cable through holes in the lead sheath resulting from electrolysis or external interference. The water will then migrate along the cable through the strands of the conductor and between the layers of insulation and make a considerable amount of cable unusable on each side of the failure. Therefore, cable failures usually involve replacement of one and sometimes two sections of cable between manholes. Following removal, the replaced section is cut back, until only dry cable remains, for future installations where the shorter length can be used.

Practically all cases of trouble are covered by reports of one kind or another. These include reports on individual cases of failures of major apparatus, 4000-v and transmission cables, transmission open-wire and network apparatus, and improper relay operation. There are also summarized reports of wires down, distribution transformer

Service Dispatchers' Board, Essex Electric Distribution Dept., Public Service Co. of N. J. with recently installed radio call system.



Trouble-shooting Lineman in this Public Service Co. repair truck uses the mobile radio outfit to contact Service Dispatchers' headquarters

failures, customers' no-light and no-power calls and the like. These reports are a great deal more than so much paper which is filed away and forgotten. Their primary purpose is to provide the information by which future troubles of the same kind can be prevented with consequent improvement to service.

The reports are analysed to determine the basic cause of the trouble. In the case of apparatus and cables, the failures are usually dissected for further information. Summarized reports show general behavior trends of different types of construction and material. Out of the data thus obtained come improvements in materials, apparatus and operating practices for which Public Service has long been noted.

The handling of trouble caused by severe storm conditions is a very different matter compared with the usual faults occurring in normal operation. Storms vary in intensity from the summer thunderstorm all the way to the 1938 and 1944 hurricanes. Only the overhead plant is affected, but when storms of hurricane proportions occur it requires the efforts of every available Distribution Department employee to restore service and make repairs.

Storms strike with little warning, not more than 24 hours at the most. All the damage to the lines takes place in a very short time and it is impossible for the usual operating force to cope with it immediately. The pole lines themselves are well able to withstand the forces imposed by high winds. By far the greatest amount of damage is caused by falling trees and tree limbs which also impede repair work and make travel difficult.

The first indication of the real severity of the storm is a flood of no-light calls from customers which effectually choke the Service Dispatchers' telephone facilities. When this occurs all customers' calls are routed to the Customers' Service Department, only those of an extreme emergency nature being permitted to go to the Service Dispatchers. Certain inter-office telephone trunks as well as a number of outside lines with unlisted numbers are kept clear for the use of the Dispatchers, Substation Operators and field men. These telephone facilities have recently been augmented by a radio system with seven fixed stations (one in each Electric Operating Division) and 154 mobile units. The radio system has not as yet been tested in a severe storm but gives every indication of being of great advantage in such circumstances.

The no-light calls from customers are sent to the Service Dispatcher by telephone or messenger where they are sorted by street location. From these and reports of circuit tripouts received from substations, a general picture of the severity and the location of the individual cases of trouble begin to emerge. At this stage efforts are made to restore service only to such customers as hospitals, pumping stations, telephone exchanges and the like. The field forces are engaged in cutting down dangling live wires, clearing up fallen poles and generally removing hazards to the public.

At the same time, arrangements are being made for additional help and material.

As the work of removing hazards nears completion, the work of restoring service is started. Transmission and 4000-v feeders come first, since repairs to these will restore service to the largest number of customers. Repairs are usually of a temporary nature. Work on street lighting circuits, secondaries and individual service wires follows.

In the meantime, all locations from which no-light calls have been received are inspected to determine the nature of the trouble, thereby eliminating many duplicate calls by the repair crews. Finally, in the case of very severe storms, the entire overhead plant is inspected to locate any damage which may have passed unnoticed.

With service restored, work is then started on permanent repairs and reconstruction of the plant to its pre-storm condition.

Complete restoration of service after the 1944 hurricane took about 9 days and permanent repairs were not completed for several months thereafter. The work involved was tremendous. There were 1700 cases of 4000-v wires down as well as 2200 street lighting wires, 8600 individual house services and 205 poles. About 300,000 individual customers and 78,000 street lights were out of service. The estimated loss of load during the storm was 173,000 kw.

The operation of an electric system under normal conditions requires a high degree of organization and individual skill. Handling a major emergency calls for more than that; it calls for a spirit of service to others and the will to get a dirty job finished without thought of reward. These characteristics usually come to the fore only in times of crisis but they are the foundations of American enterprise. In upholding the name PUBLIC SERVICE we all contribute to increase the demands for ELECTRIC SERVICE.

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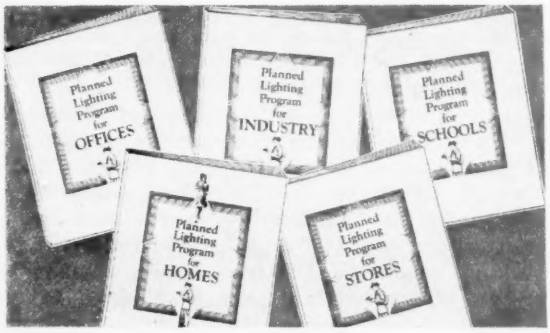
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Edison Electric Institute

420 Lexington Avenue **New York 17, N. Y.**

Service Continuity Standards Aid Economical Distribution Planning

By W. J. Lyman

Engineering Assistant to Manager, Planning and Development Dept., Duquesne Light Company

A paper presented at the Joint meeting of the Electrical Equipment and Transmission and Distribution Committees, EEI, in Atlanta, Ga., on February 12, 1947

THE past history of the electric power industry has been characterized by many and diverse improvements in equipment and methods, reductions in cost and improvements in service continuity. Improvements in the art have been used both to reduce rates and to reduce service interruptions. The reduction in outages during the last 20 years has been truly remarkable, amounting to as much as 90 per cent in some cases. The reduction in cost of service has also been quite significant, although the percentage change has been relatively smaller.

Rate Reduction and Service Improvements

A continuation of various pressures for reduction in rates may be expected in the future. Every effort will have to be made in the development of power systems to keep costs at a minimum. At the same time, further improvements in service continuity will follow the law of diminishing returns, each successive improvement becoming more expensive. Furthermore, the high quality of service now being rendered raises the question of whether or not more moderate improvements in the future would be entirely acceptable.

As equipment has become more reliable, the need for reserve capacity has in some instances diminished and this has been one of the factors resulting in lower cost. The development of more reliable transmission circuits is an example of this trend and cases may be cited where, in recent years, large and important loads have been supplied over single circuits. This would not have been possible 25 years ago, even with the lower grade of service generally acceptable at that time.

It would appear that further substantial savings in unit investment can be achieved in the future by the proper allocation of improvements in the art between cost reduction and service improvement. Some guide or standard, defining acceptable service in different categories, would obviously be very helpful in this connection. In the engineering of improvements and extensions to electric systems, various schemes are usually developed and compared before making the final choice. Service continuity is always a factor in this selection. This may be illustrated by considering two schemes, A and B, in which A is more expensive than B, but will deliver more reliable service. There has been a tendency in such cases to select the more expensive scheme, rather than to take a chance on getting into trouble because of poor service. However, if it could be demonstrated that Scheme B, although less reliable than A, would still give adequate service, the corresponding saving in capital cost could be realized. In the light of these conditions, it is believed that some form of standards for service continuity would greatly help in using improvements in the art to the best advantage and securing the greatest cost reduction consistent with acceptable service. With this objective in view, the Duquesne Light Company has developed and established service continuity standards for both the 4 kv distribution system customers and large power customers supplied from the high tension system.

Basis for Standards

Basis for Standards—In general, service now being rendered was used as a starting point. In the majority of cases present performance is considered satisfactory, based upon customer reactions and other objective considerations. In other cases, however, the past record of customer interruptions is not considered to be satisfactory and further improvements would be desirable. This general assumption does not necessarily put an end to further service improvements, since it is generally felt that any goal which might be selected would be reviewed from time to time and modified in the light of changing conditions.

One of the first problems to be faced is the variation in service quality rendered different customers. These variations are the result of different methods of supply, different exposure and protective features, and also of pure chance or probability. In general, groups which inherently have different performance, can be classified and handled separately. Even so, it is fundamental that the standard must be set somewhat above average performance in order that only the distinctly abnormal will exceed the limit. To the extent that the vagaries of chance effect the outage record, the theory of probability has been extremely useful in developing practical methods. which can be applied in a flexible manner.

Continuity Measurements

In measuring the service interruptions, both frequency and duration are necessary to adequately define the performance. Of these two items, total duration or minutes per customer per year is probably the more important. However, a given number of minutes interruption time would produce different effects on different types of customers if the time were concentrated in one or two long interruptions or distributed among a large number of short interruptions. For this reason both frequency and duration have been included in setting up the standards.

In order to reduce the variability in outages as between different years, the standards are in all cases based upon the four-year average performance. A four-year period is long enough to eliminate any wide swings due to exceptionally good or bad years. On the other hand, a longer period would tend to screen out the effect of any upward or downward trend and would, therefore, be undesirable.

Distribution System Standards—One set of standards was established for customers supplied from the 4 kv distribu-

tion system and a different set for customers supplied from the high tension system. The majority of the customers on the distribution system are residential and small commercial customers.

Service continuity is largely dependent upon load density. Urban areas with customers close together have less circuit length per customer and usually better shielding from buildings and trees. The greater load density also results in more revenue per mile of circuit, which frequently justifies the use of more reliable equipment and better protection. It was considered desirable to establish different standards for urban and rural areas. This was done in the face of the knowledge that many rural customers are inconvenienced more by service interruptions than are urban customers. The use of water pumps and other devices such as incubators, brooders, and milking machines, makes rural customers, in general, more sensitive to long interruptions. However, economic considerations usually control the expenditures for service improvement and this is both a limitation and a challenge.

Analysis of Performance

For many years service interruptions on the Duquesne Light Company system have been analyzed on a monthly and an annual basis. Thus, the trend in performance was known and also the causes of interruptions as between the different parts of the system. Distribution system outages were divided into three different groups; high tension, distribution circuit breaker operations, and part circuit interruptions.

The high tension classification includes power station, transmission line, and substation troubles which cause interruptions to the 4 kv buses at the distribution stations.

Distribution breaker operations result in outages to complete circuits or in some cases to one phase of the entire circuit.

Part circuit outages include transformer failures, primary fuse operations (not caused by transformer failures), and primary wires down. This group is more difficult to analyze because of the large number of relatively small interruptions and it has only been in recent years that fairly complete data have been made available. In the case of distribution customers, it was found that part circuit outages, on an average, account for about 20 per cent of the outages on a basis of numbers and about 50 per cent of the total outage time (after excluding interruptions lasting less than 2 minutes).

Largely because the big majority of distribution system customers are residential and small commercial, it was decided to make the standards cover only those outages lasting two minutes or longer. In general, outages of shorter duration do not cause hardship to these classes of customers.

After taking all of these pertinent factors into account, the service continuity standards for the distribution system were established as follows:

Class	Interruptions Per Customer Per Year	Minutes Per Customer Per Year
1. Urban	1½	60
2. Rural	3	120

These figures have been established on the basis of four-year averages in order to minimize the effect of extremely bad or good individual years. They were set up to be applied on the basis of individual substation areas. Because of non-uniformity, the performance of smaller areas such as a group of customers supplied from one transformer, may be expected to deviate more from the average than would the entire substation areas. An analysis of this factor, however, has shown that this difference is relatively small with the result that less than one-sixth of the individual transformer areas would have interruptions exceeding the established standards.

Fig. 1 will illustrate the relationship between the service standards and the individual performance of the automatic and attended substations. This shows that the standards could not be set equal to the average of present performance, since this would immediately place a large number of substations above the standard. In general, if it is intended to maintain approximately the same quality of service, the standard must be set at two or two and one-half times the average in order to be high enough to allow for the normal variations to be met in practice, but not high enough to include the obviously unacceptable cases. Less than 3 per cent of the load supplied from these substations has interruptions exceeding the standards.

In the case of the rural areas, however, the standard was established only slightly above present average performance, with the result that about 30 per cent of the load experiences interruptions in excess of the established limit. This was done on the basis that further efforts should be made to improve rural service and that a long range program should be worked out to accomplish this goal.

Non-Uniform Distribution of Outages—The fact that distribution customer outage duration averages less than 30 minutes per year, creates an impression of uniformly satisfactory service un-

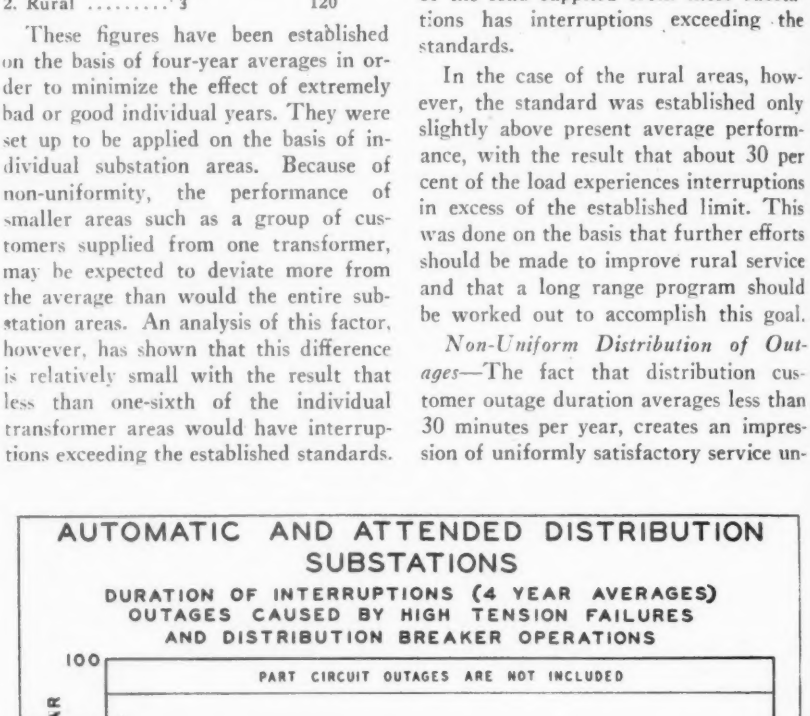

Fig. 1—To compare performance with service standards, part circuit interruptions, which account for about 50 per cent of outage duration time, must be considered. Any station on the above chart having substantially more than 30 min. interruption time from high tension trouble and breaker operations would presumably exceed the 60-min. overall standard, which also includes part circuit interruptions (transformer failures, fuse operations and primary wires down).

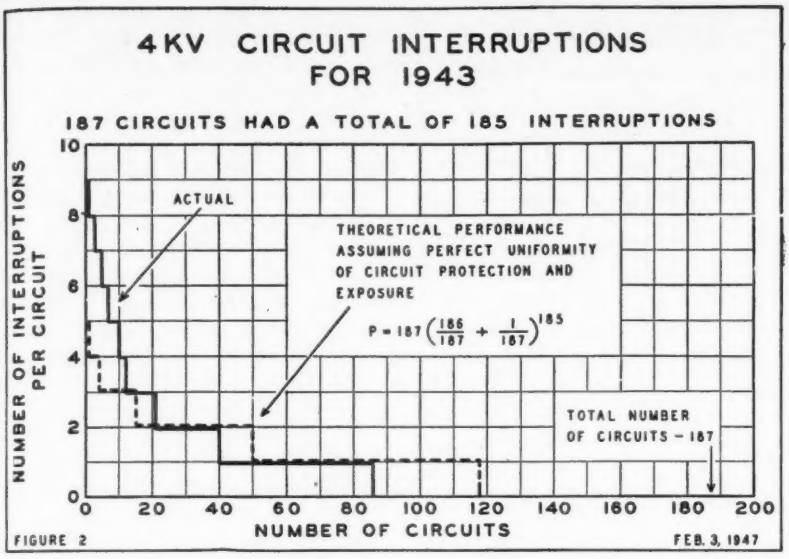
4KV CIRCUIT INTERRUPTIONS
FOR 1943
187 CIRCUITS HAD A TOTAL OF 185 INTERRUPTIONS
NUMBER OF INTERRUPTIONS PER CIRCUIT
ACTUAL
THEORETICAL PERFORMANCE ASSUMING PERFECT UNIFORMITY OF CIRCUIT PROTECTION AND EXPOSURE
$P = 187\left(\frac{186}{187} + \frac{1}{187}\right)^{185}$
TOTAL NUMBER OF CIRCUITS - 187
0 20 40 60 80 100 120 140 160 180 200
NUMBER OF CIRCUITS
FIGURE 2
FEB. 3, 1947

Fig. 2—Analysis of substation breaker operations, excluding instantaneous reclosures and counting single-phase operations as ⅓ of a circuit interruption. Of these circuits 101 had no interruptions, 46 had one, and 40 had more than one. The corresponding theoretical numbers are 69, 68 and 50.

til it is pointed out that in any one year about 10 per cent of the customers have outages averaging 2 hours each. It is sometimes assumed that this is largely the same 10 per cent each year, and that this group's service is relatively poor only because the physical characteristics of the system serving them are sub-standard in protection or exceptionally exposed to interference. It might, therefore, be assumed that by improving this portion of the system, the average outage time for this group may be reduced to where it approaches the system average (which itself will thereby be substantially lowered).

An interesting light is thrown on this problem by analysis using the probability theory. If a perfectly uniform system of 1000 customers be assumed to have 1000 outages per year, each customer would be expected to have, on the average, one outage every year. The calculated most probable occurrence for any one year, however, would be: 36.8 per cent of the customers with no outage, 36.6 per cent with one outage, 18.5 per cent with two outages, 6.1 per cent with three outages, 1.5 per cent with four outages, etc. It is most important to note that the 1½ per cent having four times the average outage rate in the one-year period are not sub-standard in protection, or excessively exposed, for the basic assumption was a perfectly uniform system.

On Fig. 2 is shown a comparison of the actual and theoretical distribution of outages among 187 4-kv circuits which experienced 185 interruptions during the year 1943. Here the average rate is about one interruption per circuit, but we see that one circuit had actually nine interruptions, three circuits had eight interruptions, and 101 circuits had no interruptions. But the theoretical distribution indicates that even with all circuits equally well protected and equally exposed (and with the same total number of outages), one circuit would have five outages, four circuits would have four interruptions each, etc. A similar analysis was made of primary fuse operations. Data were obtained from the transformer record cards for 836 transformers on several circuits located within a few miles of each other. During the eight-year period there were a total of 344 fuse operations (including transformer failures) divided among 220 transformers. There were 65 "repeaters" or transformers with more than one operation. At first thought, these 65 units might be considered to be subnormal and possibly in need of attention. However, many of these repeaters are due to mere chance. Assuming the transformers had all been equally vulnerable and with the same total of 344 operations, the most probable condition would have been 54 repeaters instead of 65.

These studies serve to show that it is not the actual number of outages any circuit or transformer experiences, but the difference between the actual and theoretical number of outages which measures the non-uniformity of performance of the group, and indicates the units which may be sub-standard in protection.

Classifying High Tension Customers—It was felt that service continuity standards for high tension customers (50 kw to 40,000 kw demand) should be applied individually rather than collectively as on the low tension distribution system. Considerable thought was given to classifying the large customers, recognizing that a single standard would be of little use in view of the wide variation in frequency and duration of interruptions. It was finally decided, therefore, to divide this group into three classes. Furthermore, it was concluded that the best criterion for service continuity classification would be the size of the customer measured in kw or kwhrs. The original attempt to classify on the basis of individual customer's requirements, was abandoned for several reasons. It would be difficult to reach an agreement on the relative importance of continuity for different customers, and although some processes require more continuous service, there would usually be room for argument. On the other hand the method of connecting a customer to the system is usually determined on the basis of the amount of power to be used. The revenue from large customers will usually justify duplicate service and automatic switching so that service continuity can easily be made satisfactory. The revenue from small customers frequently will not support the investment necessary to furnish high grade continuity and this economic fact cannot be disregarded.

Demand and Continuity

Actual experience, as portrayed on Fig. 3, demonstrates the correlation between customer demand and service continuity. On this basis, the three classes were selected and a graded set of standards was established. The service continuity standards now in effect are as follows:

Class	Customer Max. Demand (kw)	Interruptions Per Customer Per Year	Minutes Per Customer Per Year
I	Over 7500....	1.5	30
II	1001 to 7500..	3	60
III	0 to 1000.....	6	120

There are a number of rules which interpret these standards for special con-

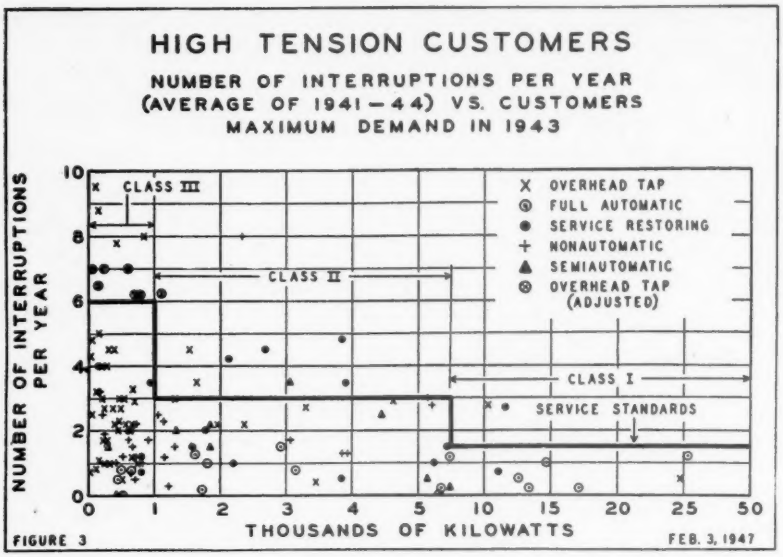

Fig. 3—Correlation between customer demand and service continuity as determined by actual experience.

ditions and which set upper limits for the duration of individual interruptions. It is recognized that considerations of public safety are paramount and exceptions to the rule can be made. For example, a hospital with less than 1000 kw demand would probably be furnished service better than that stipulated for Class III.

These standards do not cover scheduled outages for company maintenance or construction, or outages caused by the customer's equipment or requested by the customer. It has usually been possible to schedule outages for maintenance so as not to seriously interfere with the customer's operation.

The application of these standards can be divided into three general classes.

1. System planning and design studies.
2. Determination of method of connecting individual customers to the system.
3. Gauging present performance in unusual cases.

Since the standards are applied to individual customers, a considerable variation in frequency and duration must be expected. A part of this is due to differences in exposure and equipment characteristics and part of it is due to pure chance. For this reason, it would not be practical to establish standards with the intention that they should not be exceeded in any instance. A rough rule has been adopted on the basis that the probability that any individual customer will exceed the standard should not be more than one in six. This figure is consistent with past experience and also has a mathematical significance. In statistical analyses of scattered data, the "standard deviation" is frequently used as a measure of the dispersion of the points. This standard deviation is the root-mean-square of the deviations of the individual points from the average. Where the points are distributed in a normal fashion, there is about a one-sixth probability that any given case will exceed the average by more than the standard deviation. In some statistical studies a tolerance of twice the standard deviation is used. However, the probability of exceeding this limit is only about 2.3 per cent, and this was believed to be too strict a requirement for service continuity standards in their present stage of development.

Fig. 4 shows a frequency distribution of interruptions to the high tension customers of less than 1000 kw demand, which are plotted on Fig. 3. Although this distribution departs considerably from the normal distribution curve, it is nevertheless true that about one-sixth of the total number of customers (12 out of 69) exceed the mean plus the standard deviation. This principle has been utilized quite generally throughout the development and application of our service standards, and it frequently permits a logical and consistent analysis of data which, by their very nature, may be considerably scattered.

Determining Connection Methods—These standards have probably been used most frequently, since their adoption, for determining the method of connecting new power customers in order to render satisfactory service at a minimum of cost. These decisions formerly required a considerable amount of discussion and estimating, including various attempts to evaluate the effect on the customer of service interruptions and considerable delay was sometimes experienced. The new standards have provided a definite and easily applied basis for comparison and have greatly expedited the solution of these frequently recurring problems.

The majority of the large power customers on the Duquesne Light Company system are supplied from the 22 kv sys-

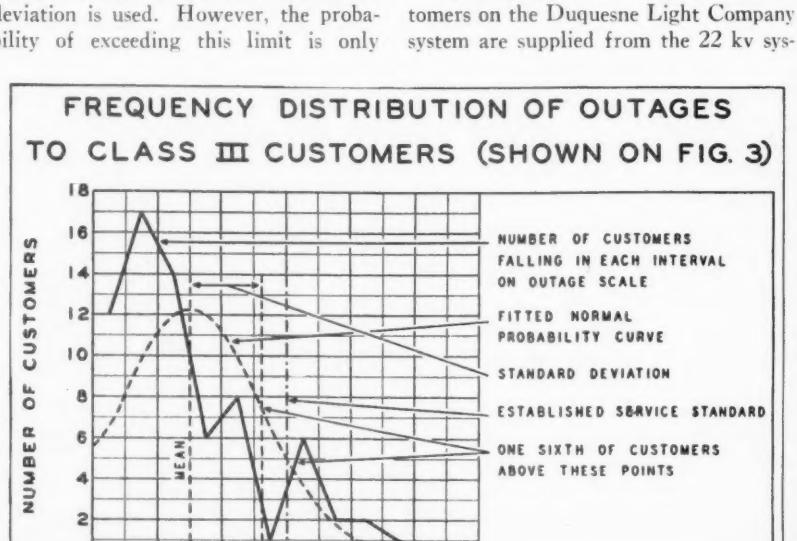
FREQUENCY DISTRIBUTION OF OUTAGES TO CLASS III CUSTOMERS (SHOWN ON FIG. 3)
NUMBER OF CUSTOMERS
NUMBER OF CUSTOMERS FALLING IN EACH INTERVAL ON OUTAGE SCALE
FITTED NORMAL PROBABILITY CURVE
STANDARD DEVIATION
ESTABLISHED SERVICE STANDARD
ONE SIXTH OF CUSTOMERS ABOVE THESE POINTS
MEAN
AVERAGE NUMBER OF INTERRUPTIONS PER YEAR
FIGURE 4
FEB. 3, 1947

Fig. 4—Frequency distribution of interruptions to high-tension customers of less than 1000-kw demand as plotted on Fig. 3.

tem, either overhead or underground. The types of connection fall into the following five general classes.

Duplicate Service

1. Full automatic—both line breakers automatic.
2. Semi-automatic — only one line breaker automatic.
3. Service Restoring—one line breaker recloses automatically to restore service.
4. Non-automatic—neither line breaker automatic.

Single Feed

5. Tap service.

Method for Measuring Continuity

A considerable amount of study was given to developing methods of estimating the frequency and duration of interruptions to be expected from the different types of service as applied to circuits of different length and characteristics. It was found that there is a relatively good correlation between frequency of interruption and the length of the circuit to which the customer is connected without an automatic circuit breaker and that this relationship is independent of the type of connection as enumerated above. Thus the line length for a full automatic customer would be zero, whereas the line length for a tap customer would be the total distance in both directions along the circuit to the nearest automatic circuit breaker.

This correlation is shown on Fig. 5. The trend line showing the most probable frequency of interruptions was found to be 0.52 plus 0.5 times the number of miles of circuit connected without an automatic breaker. The first term (0.52) includes all factors such as substation failures, operating errors, and other causes independent of line length. The second term (0.5) corresponds to a trip-out rate of 50 per 100 miles per year for the overhead circuits. This latter factor, incidentally, corresponds very closely to the actual average failure rate on the 22 kv circuits, corrected for the effect of troubles at substations which may be connected along the circuit.

Here again we find that the chance of any individual customer having an interruption rate of more than the average plus the standard deviation is only about one-sixth. From this chart, it is evident that the Class I standard (customers over 7500 kw) can be achieved only with a line length of zero, or in other words, a full automatic station. On the other hand, Class III service can be obtained as far as frequency of interruptions is concerned by a station tapped on to a circuit 8 miles long.

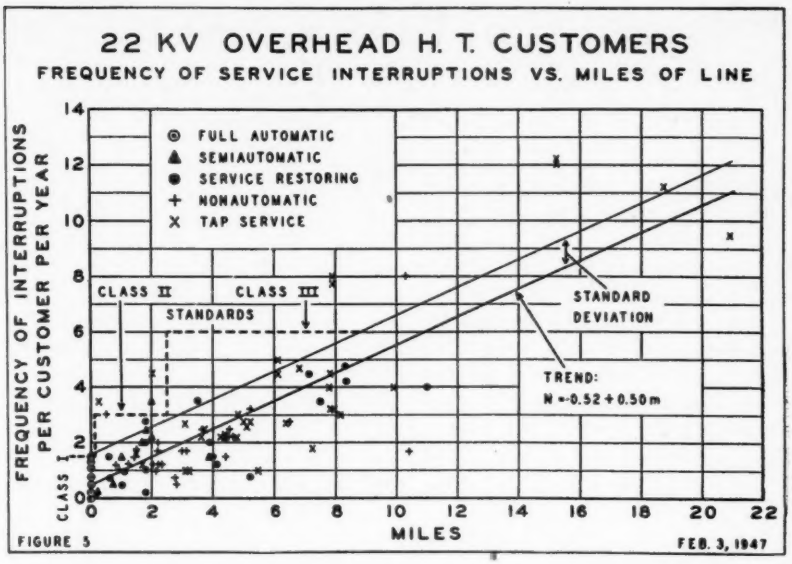

Fig. 5—Miles of line here equals the total length of overhead line plus ⅓ the length of any cable between the customer and the nearest automatic breakers. The data are in number of interruptions per year, and are the averages of the years 1941-1944 inclusive.

The problem of estimating outage duration or minutes per year was somewhat more difficult. However, it was found that the full automatic and service restoring stations would satisfy all three classes of service. The semi-automatic station, as generally applied, will satisfy Classes II and III, but not Class I. The above statements are virtually independent of line length. With the non-automatic station, the line length was found to be a factor in the probable outage duration. At this point it is necessary to take account of the amount of cable which may be involved. Since the failure rate for cables is relatively low, they have little effect upon the probable frequency, but because of the time required to repair cable failures they are an important factor in estimating outage duration. For the purpose of this study, cable lengths have been weighted with a factor of 10. Thus, one mile of cable in an overhead circuit would be counted as 10 miles in determining an equivalent circuit length.

On the above basis, a non-automatic substation, although inadequate for Class I service, is satisfactory for Class II service, provided the equivalent line length is not more than 25 miles.

The relation between equivalent line length and probable outage duration for tap customers was developed on the basis that the line length is the length of circuit to the nearest sectionalizing point, which may be automatic or non-automatic, such as a pole top switch. The results show that even for Class III service, the line length should not exceed 2.5 miles. Class II service can be rendered only by having some form of disconnecting switch on either side of the tap to the customer.

These charts are intended to furnish a basis for designing customers' connections and to be used wherever reliable and statistically stable operating performance is not available. If, however, the circuit under consideration is known to have a better or worse performance record than the system average, the data from the charts would be modified accordingly.

Operating experience with customers supplied from circuits consisting entirely of cable, has shown that any form of duplicate feed will satisfy the highest grade of service.

Tap service on the cable system is generally inacceptable for any grade of service because of the long interruptions which occur with the infrequent cable failures. It is recognized, however, that developments in cable manufacture are resulting in more and more reliability and that this factor must be considered. This is another instance where service standards, such as these, will permit taking advantage of improvements in apparatus performance by furnishing a

(*Continued on page* 346)

Joint Heat Pump Committee Organized—Holds Meeting in New York

APPOINTED this summer by the Board of Directors of the Edison Electric Institute and the Association of Edison Illuminating Companies, the newly organized Joint AEIC-EEI Heat Pump Committee held its first meeting September 4, 1947, in New York City.

After a general discussion of the heat pump picture, the Committee defined its immediate objectives. These include:

1. Assembly and analysis of test data on existing heat pump installations.
2. Coordination of present investigations of heat sources suitable for use with residential heat pumps designed for heating and cooling.
3. Coordination, compilation and dissemination of information covering application technique.
4. Cooperation with the manufacturers in their production of heat pump equipment having acceptable operating and performance characteristics.
5. Dissemination of information of general interest on the subject and coordination of the many technical and sales activities of the heat pump.

Each of the objectives was thoroughly discussed. The Committee has outlined and approved plans for getting its program under way. The assembly and distribution of published articles on the heat pump will be handled, for the present at least, through the general headquarters of the Edison Electric Institute under the direction of the Committee.

By proper coordination and analysis of the test data on existing systems and on the research and investigations now being carried out, the Committee will obtain an overall picture of the heat pump program and be in a position to guide and assist further research and investigations along the proper channels.

E. R. Ambrose of the American Gas & Electric Service Corporation is Chairman of the Committee.

The members representing the AEIC are Constantine Bary, Philadelphia Electric Company; B. A. Dmitrieff, Consolidated Edison Company; G. G. Freyder, Commonwealth Edison Company; A. D. McLay, Detroit Edison Company; Wilbur L. Sharp, Portland General Electric Company; and O. O. Wagley, Wisconsin Electric Power Company.

The Edison Electric Institute members are E. J. Amberg, Connecticut Light & Power Company; A. C. Crandall, Indianapolis Power & Light Company; E. A. Freund, Union Electric Company of Missouri; W. F. Friend, Ebasco Services, Inc.; W. J. Herrman, Commonwealth & Southern Corporation; Charles F. Lane, Virginia Electric & Power Company; William Parkerson, Middle West Service Company; and H. C. Webb, Puget Sound Power & Light Company.

Indoor Climate Committee of EEI Issues Report On the Heat Pump

THROUGH use of year-round air conditioning, made possible by the electric heat pump, the possibility of an increase in residential use of electricity in many households to an amount equal to over seven times the present average annual domestic consumption is implied in a report just published by the Indoor Climate Committee of the Edison Electric Institute's Commercial Division.

Within the next few years, the report indicates many American home owners may be using over 10,000 kwhr of electricity per year, as compared with the present average annual use of about 1,400 kwhr, assuming that suitable heat pump equipment is available and the several engineering problems still remaining are successfully solved.

The heat pump, with its promise of a future increase in electricity consumption to a figure undreamed of even a few years ago, is being actively developed by the electric utility industry, according to the report. Electric companies throughout the country are speeding test installations of heat pump systems, through cooperation with manufacturers and prospective users. Long-range studies to improve equipment, find improved heat sources and develop methods for extracting heat from these sources, have been launched by the industry, and will be a continuing activity, the report declares.

Opening with a brief history of the heat pump, the report then discusses its operating principles, with simplified diagrams used to show how the pump functions in both the heating and cooling cycles. The use of air, water and the earth itself as heat sources is described and illustrated, and their relative advantages in different areas discussed.

A survey of heat pump installations in the United States, made several months ago, showed a total of 46 residential systems, and 114 commercial installations in 18 states. Since this survey, a considerable number of new installations have been made. The installations are classified according to the heat source used in each, with a large majority employing air.

Analyzing anticipated public acceptance of the heat pump, the report states that "many utilities have found in recent years that shortages of fuels, the wish to avoid cumbersome chimneys and combustion equipment, and electrical promotion in other domestic applications have created a public desire to heat homes electrically."

Although many problems remain to be solved before the heat pump can be successfully used in every part of the country, the report declares that "compared with the diversified problems which were solved by American industry during the war, these do not seem difficult."

"The Indoor Climate Committee will survey and make available pertinent information on the heat pump," E. A. Freund, Committee Chairman, stated. "The Committee's activities will be confined to commercial aspects of the heat pump, since other utility groups are studying the technical developments, and are fostering research."

The Heat Pump Report is available from the Edison Electric Institute, 420 Lexington Avenue, New York 17, New York, at 25¢ per copy.

Personnel of E. E. I. Committees for 1947-1948

Appointments to Edison Electric Institute Committees for the Administrative year 1947-1948 have been announced by Charles E. Oakes, President of the Institute. Personnel are listed in the following pages.

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G. J. BRETT, Niagara Hudson Power Corp., Syracuse, N. Y.
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L. F. CHAMBERS, Public Utility Engineering & Service Corp., Chicago, Ill.
A. S. CORSON, The United Gas Improvement Co., Philadelphia, Pa.
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R. B. CURRAN, The Hartford Electric Light Co., Hartford, Conn.
H. L. GRUEHN, Consolidated Gas Electric Light & Power Co., Baltimore, Md.
HARRY HANSON, New England Electric Service Co., Boston, Mass.
HERBERT H. HOWARD, Niagara Hudson Power Corp., Syracuse, N. Y.
ARTHUR H. KUHN, Public Utility Engineering & Service Corp., Chicago, Ill.
J. H. LOBBAN, The Detroit Edison Co., Detroit, Mich.
C. E. PICHLER, Southern California Edison Co., Ltd., Los Angeles, Calif.
L. C. PURSELL, Pennsylvania Power & Light Co., Allentown, Pa.
GLENN RAY, Indianapolis Power & Light Co., Indianapolis, Ind.
H. H. SCAFF, Ebasco Services Inc., New York, N. Y.
R. H. SMITH, The Cleveland Electric Illuminating Co., Cleveland, Ohio.
H. P. TAYLOR, Wisconsin Public Service Corp., Milwaukee, Wisc.
R. B. TULPIN, Central Illinois Public Service Co., Springfield, Ill.
P. R. WILLIAMS, Virginia Electric & Power Co., Richmond, Va.
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W. C. YOUNG, Public Service Electric & Gas Co., Newark, N. J.
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A. G. NEUMANN, Wisconsin Electric Power Co., Milwaukee, Wisc.
WALTER OTT, The Cincinnati Gas & Electric Co., Cincinnati, Ohio.
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EDWIN HANSSON, Pennsylvania Water & Power Co., Baltimore, Md.
C. E. HICKEY, Consolidated Edison Co. of New York, Inc., New York, N. Y.
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EEI Standard Package and Standard Description Group Holds Joint Meeting with Manufacturers

A JOINT committee of the Standard Package and Standard Description Subcommittee of the Purchasing and Stores Committee, and Representatives of Manufacturers of Pole Line Hardware, was held at the William Penn Hotel in Pittsburgh, Aug. 18-20, for the purpose of developing standard uniform packaging for similar pole line hardware items.

The excellent cooperation of the Manufacturers before and at this meeting with our committee, resulted in the adoption of a plan that will ultimately result in standard uniform packing containers for all line hardware.

At the meeting, 400 of the most used items were discussed, and the amount to be packed in each box, and uniform size of package agreed to.

Those present representing the Manufacturers were: R. G. Robbins and J. E. Wennogle, Hubbard and Co., Pittsburgh, Pa.; E. R. McCoy, Joslyn Manufacturing and Supply Co., Chicago, Ill.; R. G. Wheaton, Line Material Co., Milwaukee, Wis.; H. F. Swope, Jr. and L. E. Perry, Locke Insulator Company, Baltimore, Md.; E. C. Eaglen, H. M. Malsch and W. M. Boyd, Oliver Iron and Steel Co., Pittsburgh, Pa.; W. Kirkwood, Seyler Manufacturing Co., Pittsburgh, Pa., and W. W. Wertman, Utilities Service Co., Allentown, Pa.

J. E. Wennogle, of Hubbard and Company was appointed by the Manufacturers to represent them in future discussions regarding the packaging of materials.

Those representing the EEI Committee were: G. E. Balch, Chairman of the Committee, Duquesne Light Co., Pittsburgh, Pa.; R. S. King, Union Electric Company of Missouri, St. Louis, Mo.; R. L. Leach, Georgia Power Company, Atlanta, Ga.; H. E. Hodgson, Wisconsin Power and Light Co., Madison, Wis.; G. Russell, Consumers Power Co., Jackson, Mich., and J. P. Stack, Duquesne Light Co., Pittsburgh, Pa.

Mr. Balch, who heads this Committee, has done an outstanding job—the accomplishments so far, have necessitated a tremendous amount of work. The Manufacturers have given him excellent cooperation.

This Committee intends, upon completion of the line hardware packaging job, to extend its work to other classes of material, until finally, all similar materials of all manufacturers, regularly stored in our warehouses, will be packed in uniform containers. Those not directly associated with Purchasing and Stores Operations, may not fully appreciate the value of this work. We, who are daily receiving, storing and disbursing materials know that standard packaging of materials by all manufacturers will ultimately result in a tremendous savings to utilities, in: lower handling costs; better control of inventory; simplify the taking of inventories; simplify the shipping, receiving and invoicing; contribute to elimination of errors in shipping; simplify the computing of safe floor loads; reduce the number of shipping containers, and finally, reduce material handling accidents.

EEI Planned Lighting Program to Be Presented at Lighting Exposition

"HOW to Make the Planned Lighting Program Work" is the title of an address to be presented by Merrill Skinner, Sales Manager of the Union Electric Company of Missouri, at the 2nd International Lighting Exposition, to be held in Chicago on November 3-7.

A scheduled series of five morning meetings will discuss the newest developments in lighting equipment and application techniques, with the EEI Planned Lighting Program receiving a full share of attention.

A presentation on "What's New in Lighting" will be made by George Whitwell, vice president of the Philadelphia Electric Company; H. E. Murphy, Stone & Webster Engineering Corp., and Don G. Mitchell, president of Sylvania Electric Products, Inc.

CORRESPONDENCE

Who Was Anson Clark?

Disappearance of Early American Electrical Inventor Raises Historical Search—Plea for Information

To the Editor:

Sir:

In the course of research that I have been doing for the National Speleological Society and my project of publishing a series of books on the caverns of America, I ran across a subject which I am told may be of considerable interest to the Edison Institute. Mr. John E. Kelly, of Pittsfield, a son of the late John F. Kelly, one of the founders of the Stanley G. I. Company, here, now the General Electric Company plant, suggested that I contact you on the matter.

In the small village of West Stockbridge, Mass., near here, I found a remarkable collection of material, the strangely abandoned effects of one Anson Clark, who seems to have lived in the village from 1809 to 1843, and who evidently invented and manufactured some forms of electrical machinery in the 1830's, including a dynamo and a model of an electric motor, etc., among many other inventions and scientific developments, such as a much improved and more rapid method of taking daguerrotypes, a drilling machine for which he received an award from the "Mechanics' Institute of New York City" in 1839, a street sweeping machine, belt-tightener, boring machine, and he manufactured several sorts of melodeons, operated a copperwear factory, manufactured and sold and used his own cameras and seems to have been expert in more than a dozen different trades and occupations.

In 1843 he and his wife and four children, the latter then grown to adult ages, left West Stockbridge for parts unknown—and no trace of him or his family has yet been found in the records of the town, in the records of the one-time separate village of Lisbon, Conn., now a part of Norwich, where he is believed to have been born, or at any rate lived as a boy and attended school.

A little over two years ago, Mr. James C. Moore, a well educated man, a native of West Stockbridge, discovered, stored in a barn which his father had owned, a large collection of Anson Clark's effects. They had been untouched for more than 100 years, but had been well protected and are now stored in Mr. Moore's home, where they are well cared for.

Since this find, Mr. Moore has endeavored in vain to find some trace of Anson Clark other than what he found in these effects, which included a diary that Clark kept from 1825 to 1832, account books, a record of the birth of his children, five in all, one of whom died in infancy, many scientific books, papers, scrap-books filled with clippings and notes on scientific subjects, and one large operatable electric dynamo, models of the other machines mentioned, a melodeon which can still be played, exceptionally fine mahogany and brass-trimmed spirit levels, as good as new, etc.

About six months ago I became aware of this material and have been studying it since, and have tried to find some trace of Anson Clark without success so far. There is no record at all in the town of West Stockbridge of Clark or his family, nothing in local published histories nor, so far as I can find, in any work on the development of electricity, although it appears that Clark had actually made a dynamo which was contemporary with, if not ahead of any that had been manufactured in America, and he went on lecture tours throughout New England and eastern New York State, demonstrating some of the uses of electricity. These lectures were sponsored by the "Hudson Lyceum of Natural History," according to large handbills that Clark had printed and posted.

To recapitulate: Anson Clark came to West Stockbridge as a lad in his 'teens, bringing with him a schoolboy's copy book with his name and residence, Lisbon, New London County, Connecticut, written on its cover and pages many times, with the date, 1809. He went to work as a stonecutter, and appears to have specialized in carving inscriptions on gravestones of marble. He soon went into business and eventually built a house and a studio for his photograph work, installed a small museum of curiosities, collected such things as rare prints, and improved upon a French method of taking and making daguerrotypes so that he was able to complete one in 10 or 15 seconds, where it had taken as many minutes before him.

In his diary he set down that on March 21, 1829, he began a small electrical machine and finished it March 26. He had begun a model of a screw machine March 16 and completed that. I believe that, according to published accounts of the development of the dynamo, the first one recorded was that made by Thomas Davenport, the ingenious blacksmith of Brandon, Vermont, in 1835, or at any rate, he patented his in that year, and it was later developed by Joseph Henry, of Albany.

It is rather a curious coincidence that two men of great fame in the electrical world should have later lived in the neighboring towns of Stockbridge and Great Barrington, Cyrus Field and William Stanley, and that neither they nor any others, so far as I can discover, had ever heard of Anson Clark until Mr. Moore discovered the cache of his abandoned effects. Mr. Moore's father, long dead, seems to have acquired the Anson Clark property, sometime after Clark left town, and took the effects and stored them as if to keep them for the man to claim them. James Moore says that his father never told him anything about them.

Being somewhat of a historian myself, I am puzzled at the complete vanishing of this man who appears to have been a genius of varied accomplishments, self-educated, widely traveled, and yet whose history seems to have lain obscured among his own effects for a century.

Yours very sincerely,

Clay Perry

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PRICE:

$5.00 per copy to EEI members; $8.00 to non-members of EEI. This price includes cover and set of the above listed sections. Sections 1, 2, 3, 4, 11, 13 and 14 are now ready; the other sections will be mailed to Manual purchasers, in proper quantities, when printed.

EDISON ELECTRIC INSTITUTE

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Planned Lighting Program Described At Press Conference

THE industry-wide promotion of planned lighting by electric utility companies, which will consist basically of showing customers the reasons why lighting should be planned by an expert before investing in fixtures, is expected to improve lighting standards in five major utility markets, Ralph P. Wagner, Chairman of the Edison Electric Institute's Commercial Division, told a meeting of press representatives in New York on Aug. 20. Five separate advertising and promotional programs have been prepared for use in selling planned lighting to homes, stores, schools, offices and factories. This represents the most comprehensive promotional campaign as yet sponsored in the lighting field, Mr. Wagner said.

Electric companies using these programs will, in cooperation with electrical wholesalers, retailers and contractors, urge their customers to buy only carefully-planned lighting installations, and will make the lighting plans to them available without cost, Mr. Wagner said. "Emphasis on planned lighting will mean greater satisfaction and true economy for the customers, and will help to prevent many hasty and unwise purchases of inferior lighting equipment," he pointed out.

Although the program is only now becoming available, the purchases of advertising and sales materials by electric companies indicate that promotion of planned lighting will get under way this fall in nearly every part of the country, Mr. Wagner said.

Over 30 million homes need four times the amount of light they now have, in order to meet the most conservative standards recommended by lighting authorities, the meeting was told by Harry Restofski, Chairman of the Better Light-Better Sight Bureau. Most lamps and lighting fixtures for the home are purchased for decorative appeal, rather than for seeing value, which emphasizes the need for wider public understanding of the value of better light in protecting vision.

"Our 258,000 schools, with 30 million pupils, should have seven times as much light; 100,000 office buildings, with 5 million workers, five times as much, and 200,000 industrial plants need four times the amount of light that they now have," Mr. Restofski said.

EEI Publishes Farm Electrification Manual

THE Edison Electric Institute's Farm Electrification Manual, the most comprehensive as yet prepared in this field, which is designed to serve as a technical handbook for electric company rural representatives, cooperative managers and others engaged in farm electrification work, is now being distributed to purchasers, the Institute has announced.

The manual is prepared in section form, with each section covering a major farm use of electricity, and written by outstanding authorities in each field. A committee of 25 leading farm electrification specialists, located in every part of the country, reviewed each section and made suggestions that were incorporated in the final drafts.

A total of seven sections, on the Rural Representative and His Job; History of Farm Electrification; Farm Lighting; Mow Curing of Hay; Farmstead Wiring; Farm Power, and a directory of manufacturers of farm electrical equipment, are at present available. Seven additional sections are now in preparation, and will be released shortly.

The practical information on farm applications of electricity contained, with many illustrations and diagrams of wiring arrangements, installation methods for electrical equipment, etc., is expected to make the manual of use to the rural representative in almost every customer contact.

The actual preparation of the manual was accomplished by a committee of the EEI Farm Section, under the chairmanship of John L. Burgan, of the New York State Electric & Gas Corporation.

The Farm Electrification Manual is available at Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y. The price, which includes the binder and total of 14 sections, is $5.00 per copy to EEI members, and $8.00 to non-members.

Guide to Selection of Sales Personnel Published by EEI

PLANNED selection and placement of salesmen will increase average individual sales, narrow the wide range that exists between high and low sales records in most departments, and will reduce sales personnel turnover with its resulting high cost, it is stated in a report of the Sales Personnel and Training Committee, Commercial Division, Edison Electric Institute, which has just been published by EEI.

Entitled "A Guide For the Selection of Sales Personnel," the manual outlines a suggested method for selecting and placing salesmen, based upon a uniform pattern now being developed from the many procedures originated by trade associations, schools and business organizations. Through this procedure, it is said, the sales executive can learn as much as possible about the applicant, predetermine the impression he will make upon customers, and conclude how well he will fill the available position.

Job Specifications Included

Covered in the manual are recommended procedures for the preliminary screening interview, preparing an adequate application form, interviewing and rating methods, and correlation of all information required to make a decision on hiring, among other steps. The manual concludes with detailed job specifications for eight of the most important sales positions in electric companies.

"In most electric utility companies, the sales or commercial department is primarily responsible for personal contact with customers," R. S. Bell, Chairman of the committee, declared. "Since the attitudes and actions of these employees determine to a large extent the standing of the company in the community, it is essential that careful attention be devoted to methods used in selection and placement of sales personnel."

The detailed preparation of the manual was accomplished by a subcommittee of the Sales Personnel and Training Committee, Mr. Bell said, of which the chairman is E. O. George, of The Detroit Edison Co., Detroit, Michigan.

"A Guide For the Selection of Sales Personnel" is available from Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y., at 75¢ per copy.

Utilities Finance Idaho Farm Electrification Research Program

THE University of Idaho will be the focal point in a new, state-wide farm electrification research program, which will be financed by a grant of $7,500 a year from the three power companies operating in the state, the Idaho Power Company, The Washington Water Power Company, and the Utah Power and Light Company. Formal approval of the program has been given by the university board of regents.

Directing the new program will be a state-wide committee composed of a farmer from the territory served by each of the cooperating companies, a representative of each company, and five representatives of the agricultural and engineering divisions of the university. Dean D. R. Theophilus of the college of agriculture will be chairman of the state committee and J. W. Martin, head of the department of agricultural engineering, will be project leader and secretary.

"Idaho has gone through a period of extensive expansion in farm electrification," explains Professor Martin. "At present, 89 per cent of Idaho farms have electric service, making the state one of the national leaders in farm use of electricity. The rapid expansion period is over. We are now in a period calling for intensive research."

First step in developing this research for Idaho will be a state-wide survey to gain up-to-date facts on the present status of electrification in all farming areas. Studies will seek new uses for electricity in farm production and ways by which electric service may be available to the farms not now served.

Safety Film Available from EEI

"SNAKE EYES," a new sound-slide safety film dedicated to taking the gamble out of electrical maintenance work around live station equipment, has been made available now for distribution to power companies through the Accident Prevention Committee of the EEI.

In this film reliable safety procedures are clearly enacted in vivid sequences that point up valuable lessons for all electric station personnel who work near live equipment. The procedures shown are based on the recommended safety practices employed by one company, the Wisconsin Public Service Company, which produced the film under the auspices of the Visual Education Subcommittee, EEI. Although other companies' practices may not be identical, the film adds to a fuller knowledge of safety procedure by accenting the essentials of careful planning, painstaking adherence to sound procedure and constant vigilance.

Sequences in the film deal with such procedures as arrangement for the interruption ahead of time, clearing up questions, receiving clearance, planning the job, placement of hold cards, visual check of switches and breakers, locking switches open, method of grounding, removing fuses from control circuits, marking safe working area, active supervision, use of watcher and the sequence for restoring service after the job is done.

The film itself consists of 48 frames on 35 mm film and the record is a double face, 12-in. record, recorded at 33 1/3 rpm. The price for the record and the film is $7.50. Orders can be sent now to: Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y.

Commercial Cooking Folder Published by EEI

"INVEST One Cent in Electricity," restaurant owners are urged in a novel mailing piece prepared by the Commercial Electric Cooking Committee of EEI. The folder then proceeds to show how a penny's worth of electricity, applied to electric cooking appliances, can return an extra-size portion of profits.

Electric grills, coffee-makers, deep fat fryers and other major types of commercial cooking equipment are covered in the folder, which lists the surprisingly large quantities of food they will prepare at an operating cost of one cent. Brief, hard-hitting paragraphs drive home the importance of electric cooking's low cost to the restaurant operator.

With managers of food establishments vitally concerned over rising food costs and other expenses, it is expected that the message of economical operation of electric cooking equipment contained in this folder will be particularly timely, according to W. Grant Parry, chairman of the committee.

Printed in three colors and cleverly designed to resemble a large-size penny, the 12-page mailing piece is expected to prove highly effective.

"Invest One Cent in Electricity" is available from EEI at 4¢ per copy, in quantities up to 1000. Over 1000, the price is 3¢ per copy.

Service Continuity Standards Aid Economical Distribution Planning

(*Continued from page* 329)

means of measuring the service hazards and determining whether or not any proposed new method will be acceptable.

Conclusions—The stardards for service continuity, which were adopted by the Duquesne Light Company during the year 1946, have already proved very useful in several respects.

Customers' connections have been expedited by using these guides to arrive at consistent and generally acceptable results.

A long range economic study of various types of distribution systems is now in progress and these service continuity standards have made it possible to make comparisons between the different schemes considered and to accept or reject certain of the plans on an organized and consistent basis.

There are certain locations on the system where consideration has been given for many years to making improvements where the service is generally believed to be below par. Since no recognized maximums were available, the arguments for improvement lost some of their force. The new standards offer a definite guide and point the finger directly at those places where consideration should be given to reducing customer interruptions. It has been found that a specific standard for both number of interruptions and duration has made it possible to quickly settle certain cases which were difficult to evaluate without some concrete guide to use as a basis.

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Sales Training Manual—Commercial Electric Cooking (1941)	1.50	1.50
Storm Loading and Strength of Wood Pole Lines and a Study of Wind Gusts (1936)	2.00	5.00
Weekly, Monthly and Annual Statistics (Includes Annual Statistical Bulletin; Weekly Electric Power Output; Monthly Electrical Research Statistics)	2.00	2.00

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Edison Electric Institute Bulletin (Monthly)	2.00	2.00
Farm Electrification (a bi-monthly publication) Up to 10 copies	Free	
Over 10 copies	.50	1.00
Discount for orders of 25 or more	25%	

PERSONALS

BERNARD F. BRAHENEY of Minneapolis, was elected President of the Northern States Power Company of Minnesota, at a meeting of the Board

MR. BRAHENEY

of Directors held at Minneapolis, July 24, 1947. He succeeds the late Theodore D. Crocker.

HENRY C. CUMMINS, also of Minneapolis, vice president in charge of operation was elected first vice president. He will continue in charge of operation.

These announcements were made by Robert F. Pack, Chairman of the Board of Directors, who also stated that he will continue as Chairman of the Board and will be available for consultation with officers and directors of the company.

Mr. Braheney has been connected with Northern States Power Company directly or indirectly since 1910, being first employed at Stillwater in the accounting department. Later he was connected with various divisions of the company and the general office at Minneapolis. In 1920 he became associated with Public Utility Engineering and Service Corporation with offices in Chicago. His duties with the service company consisted principally of financial and accounting counsel to various companies, including the Northern States Power Company system. In 1942 he left the service company to again become directly connected with Northern States Power Company at Minneapolis as vice president and treasurer, which position he held at the time of his election as president.

Mr. Cummins joined the Northern States organization in 1911 and continued with the company until 1917, serving in various operating capacities. From 1917 until 1939, he was a member of the operating division of the Public Utilities Engineering and Service Corporation, Chicago. On January 1, 1939, he rejoined Northern States to become vice president in charge of operation which department he still heads.

The appointment of VINCENT P. MCDEVITT as general counsel in charge of the legal department of the Philadelphia Electric Company, succeeding the late Bernard P. Carey, has been announced by Horace P. Liversidge, chairman of the Board.

A native Philadelphian, Mr. McDevitt attended the Wharton School of the University of Pennsylvania before matriculating at Temple University Law School. He was admitted to the Bar in 1928, one year before his graduation, after which he engaged in general legal practice with the late William Findlay Brown.

He was appointed assistant district attorney of Philadelphia in 1935, and for ten years was prominently identified with the work of that office. In 1945 he was named chief counsel of the Pennsylvania Utilities Commission, and served in that capacity until December, 1946, when he resigned to devote full time to his private practice in Philadelphia.

Mr. McDevitt is senior partner of the law firm of McDevitt, Philips, and Farran, and is a member of the Philadelphia, Pennsylvania, and American Bar Associations. He is a former member of the board of governors and former chairman of the membership committee of the Philadelphia Bar Association. He is chairman of the committee of meetings and a member of the judiciary committee of the same Association. A former member of the state executive committee of the Pennsylvania Bar Association, he is now vice chairman of the interstate compact committee of the Association.

HERBERT C. FREEMAN, Vice President of the North American Company since 1927, has been elected President of the Company to succeed Edward L. Shea who resigned last month to become President of Ethyl Corporation.

Mr. Freeman is also Chairman of the Trustees and member of the Executive

MR. FREEMAN

Committee of the New York State Y. M. C. A.s; trustee, Y. M. C. A. Retirement Fund; member of the Board, McBurney Branch of New York City Association of Y. M. C. A., and member of American Institute of Accountants.

PAUL D. PREGER and JOHN G. JOHANSEN have been elected vice presidents of the North American Company. Mr. Preger was first employed by North American in 1923, prior to which he was associated with Price, Waterhouse & Co., and E. H. Rollins & Son. He became comptroller of North American in 1935 and a director in 1942. He is a member of the Controller's Institute of America. Mr. Johansen was first employed by the company in 1924. He became secretary in 1942 and a director in 1942.

E. W. LEINIG has been appointed Assistant Comptroller of North American and JOHN P. ROGERS becomes General Auditor.

CHARLES S. THORN, vice president and general manager of the Birmingham Electric Co., has been elected president of the company. His predecessor, WILLIAM M. ROGERS, resigned but will continue as chairman of the board.

Mr. Thorn is an electrical engineering graduate of Rensselaer Polytechnic Institute class of 1913. Before going to Birmingham Electric in 1927, he was

associated with the Philadelphia Electric Co. and Florida Power & Light Co.

His first position with Birmingham was in the engineering department. He has been progressively promoted to chief engineer, assistant to the president, and vice president and general manager.

M. F. M. WERTH, who was active over the past 24 years in developing and operating the generation, transmission and distribution facilities of Pennsylvania Power and Light Company, Allentown, Pa., has retired as general superintendent of the Pennsylvania utility. Mr. Werth is succeeded by W. J. D. GEARY, who has served with PP&L and its predecessor companies since 1912.

With the exception of one year, Mr. Werth has devoted his entire business career to the advancement of the electrical industry, being active successively in the equipment branch, including both sales and installation, the transportation field and the light and power business. At PP&L he has successively held the positions of superintendent of generation, superintendent of operation and general superintendent.

Born in Richmond, Va., Mr. Werth attended Richmond public schools and graduated in 1902 from Virginia Military Institute as an electrical engineer. His first position following graduation was with the Chesapeake and Ohio Railroad in civil engineering work. A year later he joined General Electric Company and since that time has been employed in various capacities in the electrical industry. In the interim to 1923, when he came to PP&L from Sanderson and Porter, Engineers, of New York City, Mr. Werth had been employed by the Witherbee Igniter Company, New York City; Mahoning-Shenango Railway and Light Company, Youngstown, O.; British Columbia Electric Company, Vancouver, B. C., and Detroit United Railway, Detroit.

Mr. Geary, who had been superintendent of operation for the company in Hazleton, Pa., will continue to make his headquarters there. He joined a predecessor company of PP&L in 1912 as a meter tester and has since held positions as foreman of the meter testing department, test engineer and general foreman. In 1923 he was appointed Lehigh Division superintendent in Allentown; and in 1930 superintendent of transmission and in 1939 superintendent of operation at Hazleton.

Other changes in the PP&L organization, which became effective at the same time, are appointment of J. A. SNYDER as assistant general superintendent, C. E. LEWIS, superintendent of generation; C. H. FRICK, manager, coal bureau, and R. L. HALLMAN, plant betterment engineer. Mr. Snyder, who has been with PP&L 27 years, Mr. Lewis, 25 years, and Mr. Hallman, 26 years, will make their headquarters in Hazleton. Mr. Frick, who has served with the company for 30 years, will remain in Allentown.

ROY W. GODLEY, for the last 16 months rural service manager of EEI, has resigned to join the Kroger Company, Cincinnati, Ohio. In his new position, Mr. Godley will be engaged in public relations activities, with special emphasis on agricultural development in the 18 states now served by the Kroger company.

A native of Arkansas, Mr. Godley graduated from Oklahoma A & M in 1932, and then spent two years in graduate work in agricultural subjects at West Virginia University. From 1934 to 1936 he was a county agricultural agent in West Virginia.

Mr. Godley joined the utility industry in 1936, when he became agricultural counselor for the Monongahela Power Company, at Fairmont, W. Va. He took an active part in the company's agricultural development program for the next 10 years, resigning to join the Institute in 1946.

GEORGE A. DREWETT has been appointed superintendent of construction for the Pacific Power & Light Co., with headquarters at Portland. He has been serving as division engineer at Vancouver, Wash. In his new capacity he will supervise construction and maintenance on power transmission facilities for the Pacific system. He succeeds R. E. FORMAN, who has been appointed to a new post as superintendent of distribution. A. O. MANGOLD becomes division engineer, replacing Drewett.

Reorganization changes in personnel as a result of the merger of the Pacific Power & Light Co. and Northwestern Electric Co. include the appointment of E. F. PEARSON to the position of assistant general manager of the northwestern division of Pacific Power & Light, in charge of the company's operations in Portland and Rainier, Ore., and Vancouver and Camas, Wash.

Other new assignments, announced by GEORGE T. BRAGG, vice president and general manager of the enlarged Pacific organization include:

CECIL A. ROOT, member of Northwestern's Vancouver staff since 1934, promoted to Vancouver district manager.

J. C. PLANKINTON, head of Northwestern's commercial department, named assistant to the vice president in the rates and research department.

D. B. LEONARD, acting assistant general manager, appointed sales manager for the merged operation, with headquarters in Portland.

Succeeding him will be T. M. KEEMAN, acting commercial manager.

H. H. SCHOOLFIELD, formerly Pacific's general superintendent, named chief engineer of the combined companies.

O. L. LEFEVER, head of Northwestern's engineering section, made assistant chief engineer of Pacific.

D. R. MCCLUNG, assistant superintendent, becomes Pacific's general superintendent and TOM PERRY becomes superintendent of the Northwestern division.

Other appointments: S. E. SKELLEY, personnel supervisor; A. W. ANGELL, supervisor of transportation; R. L. STOUT, right-of-way engineer, and H. W. MILLAY, administrative assistant in the office of the president.

GEORGE H. HAGAR has been appointed engineer of electric operation of Pacific Gas & Electric Co., San Francisco. He succeeds DUNLAP D. SMALLEY, who took office July 1 as vice president in charge of PG&E operations.

Mr. Hagar, who has been associated with Pacific Gas and its predecessor companies for 35 years, is an electrical engineering graduate of the University of California. He was assistant to the general superintendent of the Great Western Power Co. for ten years prior to its merger with PG&E in 1930, when he became assistant engineer of operation.

HOMER G. KEESLING, electric superintendent of the company's East Bay division, has been appointed central area superintendent, replacing Mr. Hagar. MELVILLE N. CLARK, electric service superintendent of the East Bay division, took Mr. Keesling's position.

HAROLD V. RATHBUN has been appointed transmission and distribution en-

gineer for the Western Light & Telephone Co., Kansas City, Kan. Mr. Rathbun has had extensive experience in the electrical field through association with such organizations as Century Electric Co., St. Louis; General Electric Co., Schenectady, N. Y.; and Kansas City (Mo.) Power & Light Co. He also traveled extensively throughout the Middle West as a representative of the Copper Wire Engineering Association. Following discharge from military service in 1946, he returned to the Copperweld Steel Co., Glassport, Pa., whom he represented in the Middle West before entering military service in 1942.

HAROLD D. BEEBE, who has been transmission superintendent and has served as assistant to vice president M. R. McKinley of Tampa (Fla.) Electric Co., has been made general superintendent of the company. He has been succeeded as transmission superintendent by J. D. HICKS, assistant superintendent.

Mr. Beebe joined Tampa Electric in 1935 following graduation from Yale University. He has worked in most of the company's production and distribution departments.

Announcement has been made recently by G. W. Van Derzee, president of the Wisconsin Electric Power Co., Milwaukee, of the following sales personnel changes:

The title of F. A. COFFIN has been changed from vice president and sales manager to vice president in charge of sales, in order to broaden his executive responsibilities and to relieve him of certain details of sales activities.

I. L. ILLING has been advanced from position of assistant sales manager to sales manager. In this position he will be in direct charge of all activities of the sales department.

WILLIAM H. WAGNER, formerly industrial sales engineer, has been appointed assistant sales manager. In this position he will assist Mr. Illing in the general supervision of the company's sales activities.

H. E. KING, senior commercial customer representative in West Penn Power Co.'s eastern division, with headquarters at Greensburg, Pa., has been promoted to supervisor in the Commercial customer department, and will be located at Pittsburgh. He succeeds D. W. GROSSHANDLER, who resigned to become assistant sales manager of the commercial cooking division of Hotpoint, Inc., Chicago. H. T. DUTTER, JR., has replaced King at Greensburg.

CHARLES P. CRANE, executive vice president of the Consolidated Gas, Electric Light & Power Co. of Baltimore, was elected president of the Maryland Utilities Association at the recent annual meeting.

Mr. Crane began his service with Consolidated in 1910 when he was employed as secretary in the vice president's office. He was promoted to assistant to vice president in 1919, vice president in 1938, and executive vice president in 1946.

HOWARD G. CARTER has been appointed superintendent of light and power for the Western Division of Puget Sound Power & Light Company at Bremerton, to replace the late A. M. McDonald. With a background education in engineering at the Texas College of Mines, Carter joined Puget Sound at Bremerton eleven years ago as a clerk in the operating department and worked up to assistant superintendent in 1946.

L. W. BYRON, formerly merchandising supervisor for the Wisconsin Power & Light Company, has been appointed residential sales manager, succeeding Frank J. Cottrill, retired. Mr. Byron has been identified with the Madison properties since 1930.

FRANCIS H. LACY, JR., of Marble Falls, Tex., has been added to the territorial development staff as agricultural economist for Monongahela Power Co. Mr. Lacy is a graduate of Texas A. & M. College and recently completed work on a master's degree in farm management and agricultural economics at Purdue University.

F. CARTER WOMACK has succeeded E. H. WILL, who resigned recently as president of the El Paso Electric Co. to become general manager of the Electric Department of Virginia Electric & Power Co.

Mr. Womack started with VEPCO as a water boy with construction forces at Richmond. He was promoted rapidly and secured broad experience in the electrical field, both in engineering and administrative work. He was in charge of electrical maintenance and construction in Richmond and before leaving the company was manager of the Transportation Division in Norfolk.

In October 1933 he was transferred to the Mesilla Valley Electric Co. headquarters in Las Cruces, N. M., as vice president. Later he became president. When Mesilla Valley merged with El Paso Electric in January, 1941, Mr. Womack was made vice president in charge of Mesilla Valley Division.

WILLIAM G. BURRILL, sales manager, Staten Island Edison Corp., has retired after 33 years in the utility industry. He started his career with the Bangor (Me.) Hydro-Electric Co. and was commercial manager of that firm when he resigned to come to Staten Island. While in Maine he aided in the organization of Station WABI, the first station east of Boston and was its director for two years. He was the founder of the Staten Island Electrical League.

THEODORE F. BREITHAUPT, western division engineer of the Connecticut Light & Power Co. since 1939 and for over 37 years connected with that utility, has retired. His successor is GERALD H. DAVIS, who joined the company in 1927 and has lately been northern division engineer. WILLIAM H. BALKE, who has been with the CL&P since 1929 in the operating and engineering departments at Waterbury and elsewhere, becomes northern division engineer at Thompsonville.

WALTER H. SAMMIS, president of Ohio Edison Company, was nominated recently to the Board of Trustees of Columbia University to serve until 1954. Mr. Sammis will serve as alumni representative on the board and is the forty-second alumnus so honored in the history of the University. He is a graduate of the School of Engineering, Class of 1917, and at his graduation was awarded the Illig Medal for scholarship.

Following his discharge from active service in World War I, he became an instructor in electrical engineering at the University in 1919 and the following year entered the public utility field with the Consumers Power Company in Jackson, Michigan. In 1943 he was awarded the University's alumni medal for conspicuous service to the Engineering Alumni Association. In 1943-45 he was a member of the Board of Directors of the University's Alumni Federation representing engineering alumni.

Ebasco Plans Safety Program

MEETING recently in New York, a committee of Safety Directors of Ebasco client companies in the United States completed their program for the annual Ebasco Safety Meeting to be held Oct. 6-8 in Chicago. These meetings have been held annually since 1938 in conjunction with the National Safety Congress for the benefit of Safety Directors and executives concerned with safety and related to matters in client utility companies of Ebasco operating in some 30 states.

The program this year will deal with Safety and Job Training, Aptitude and Psychological Tests for Selection of Safe Workers, Safety Problems in Construction and Fire Protection. A feature of these meetings is a round table discussion providing for exchange of ideas and presentation of new developments and devices designed to protect the worker from accident and health hazards. W. T. Rogers, Safety Consultant, Ebasco Services Incorporated, New York, is Chairman of the Program Committee.

Electric Road Show of Union Electric Packs 'Em In

(*Continued from page* 315)

drops, signs, had to be worked out for every location.

Dealers Enthusiastic

Dealer enthusiasm for the shows spread like wildfire. Often a spirit of rivalry between nearby towns spurred each to outdo the other. They whipped up booths out of cardboard, gave them homey touches of wallpaper and linoleum, and went all-out on advertising and promotion.

Yes, Sir, there's no business like show business.

Japan's Electric Rates Increased Threefold

The Government has approved a raise in electricity rates in Japan. The new schedules, which, it is hoped, will be sufficient to cover the companies' wage increases resulting from the last electrical-industry dispute, went into effect in April and provide for 2.6 times the former charges for domestic service and 3.5 times those previously charged for industrial uses. — *Foreign Commerce Weekly.*

CONVENTIONS AND MEETINGS

1947

SEPTEMBER

5-6 Management Conference, Wisconsin Utilities Association, Hotel Northernaire, Three Lakes, Wis.
5-11 National Electrical Contractors Association, San Francisco, Cal.
8-9 Accident Prevention Committee, EEI, 420 Lexington Ave., New York, N. Y.
15-19 Illuminating Engineering Society, Roosevelt Hotel, New Orleans, La.
17-19 Indiana Electric Association, French Lick Springs Hotel, French Lick, Indiana
22-24 Meter and Service Committee, EEI, and Meter and Service Methods Committee, AEIC, Lord Baltimore Hotel, Baltimore, Md.
22-24 Northwestern Section, International Association of Electrical Inspectors, Eugene Hotel, Eugene, Ore.
23-24 Pennsylvania Electric Association, Annual Convention, Benjamin Franklin Hotel, Philadelphia, Pa.
25-26 Accounting Section, Wisconsin Utilities Association, Dell View Hotel, Lake Delton, Wis.
25-26 Southeastern Electric Exchange, Fall Conference Engineering and Operation Section, Henry Grady Hotel, Atlanta, Ga.
25-26 Wisconsin Utilities Association, Accounting Section, Dell View Hotel, Lake Delton, Wis.
25-27 Southeastern Electric Exchange, Engineering and Operation, Henry Grady Hotel, Atlanta, Ga.
29-Oct. 1 Purchasing and Stores Committee, EEI, Henry Grady Hotel, Atlanta, Ga.
29-Oct. 1 Southwestern Section, International Association of Electrical Inspectors, Mission Inn, Riverside, Calif.

OCTOBER

6-7 Prime Movers Committee, EEI, Benjamin Franklin Hotel, Philadelphia, Pa.
6-7 Electrical Equipment Committee, EEI, Benjamin Franklin Hotel, Philadelphia, Pa.
6-8 American Gas Association, Annual meeting, Cleveland, Ohio.
6-8 Association of National Advertisers, Atlantic City, N. J.
6-10 35th National Safety Congress and Exposition, Chicago, Ill.
7-8 National Farm Electrification Conference, Claypool Hotel, Indianapolis, Ind.
8-11 International Association of Electrical Leagues, Statler Hotel, St. Louis, Mo.
9-10 Transmission and Distribution Committee, EEI, Benjamin Franklin Hotel, Philadelphia, Pa.
13-15 Western Section, International Association of Electrical Inspectors, Mount Royal Hotel, Montreal, Can.
15-18 American Society of Civil Engineers, Fall Meeting, New Orleans, La.
16-17 Missouri Valley Electric Association, Accounting Conference, President Hotel, Kansas City, Mo.
16-17 Pennsylvania Electric Association, Transmission and Distribution Committee, Fort Ligonier Hotel, Ligonier, Pa.
20-22 Eastern Section, International Association of Electrical Inspectors, Seaside Hotel, Atlantic City, N. J.
21-23 American Standards Association, Waldorf-Astoria Hotel, New York, N. Y.
23-24 Pennsylvania Electric Association, Prime Movers Committee, Benjamin Franklin Hotel, Philadelphia, Pa.
27-29 Southern Section, International Association of Electrical Inspectors, George Washington Hotel, Jacksonville, Fla.
27-30 National Electrical Manufacturers Association, Hotel Traymore, Atlantic City, N. J.
29-31 Southeastern Electric Exchange, General Sales Conference, Atlanta Biltmore Hotel, Atlanta, Ga.
30-31 Pennsylvania Electric Association, Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, Pa.
30-Nov. 1 Missouri Valley Electric Association, Rural Round-Table Discussion, Sales and Rural Conference, Skirvin Hotel, Oklahoma City, Okla.

NOVEMBER

3-7 International Lighting Exposition, Stevens Hotel, Chicago, Ill.
12-13 Southeastern Electric Exchange, Fall Convention, Hotel Roosevelt, New Orleans, La.
13-14 Pennsylvania Electric Association, Communications Committee, Lord Baltimore Hotel, Baltimore, Md.
19-21 Joint Convention of Gas & Electric Sections, Commercial & Technical Divisions, Wisconsin Utilities Association, Schroeder Hotel, Milwaukee, Wis.
21-22 New Jersey Utilities Association, Seaview Country Club, Absecon, N. J.

DECEMBER

1-5 The American Society of Mechanical Engineers, New York, N. Y.
3-5 52nd Annual Congress of American Industry, National Association of Manufacturers, Waldorf-Astoria Hotel, New York, N. Y.

JANUARY

26-30 American Institute of Electrical Engineers, Pittsburgh, Pa.

EDISON ELECTRIC INSTITUTE OFFICERS AND COMMITTEES

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(Terms Expiring 1948)

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(Terms Expiring 1949)

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(Terms Expiring 1950)

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General Accounting, O. K. BOYD.....Consolidated Gas Electric Light & Power Co., Baltimore, Md.
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Insurance, I. M. CARPENTER.....Ebasco Services Inc., New York, N. Y.
Membership, J. F. FOGARTY.....The North American Co., New York, N. Y.
Purchasing and Stores, R. S. KING.....Union Electric Company of Missouri, St. Louis, Mo.
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Rate Research, E. N. STRAIT.....Public Utility Engineering & Service Corp., Chicago, Ill.
Statistical, WINSOR MARTIN.....Public Utility Engineering & Service Corp., Chicago, Ill.
Transportation, JEAN Y. RAY.....Virginia Electric & Power Co., Richmond, Va.
Codes and Standards (a Subcommittee of the Board of Directors), H. B. BRYANS..Philadelphia Electric Co., Philadelphia, Pa.